ENGINEERING GRAPHICS

Topic:

Drawing Instruments

Drawing Instruments

- **Engineering Drawing is entirely a graphic language.**
- **Drawing equipment and instruments are needed to record information on drawing paper or any other suitable surface.**

Drawing Instruments

Drawing Sheets

Drawing sheets are the 'canvases' on which drawings are composed by pencils. Drawing sheets are available in standard sizes.

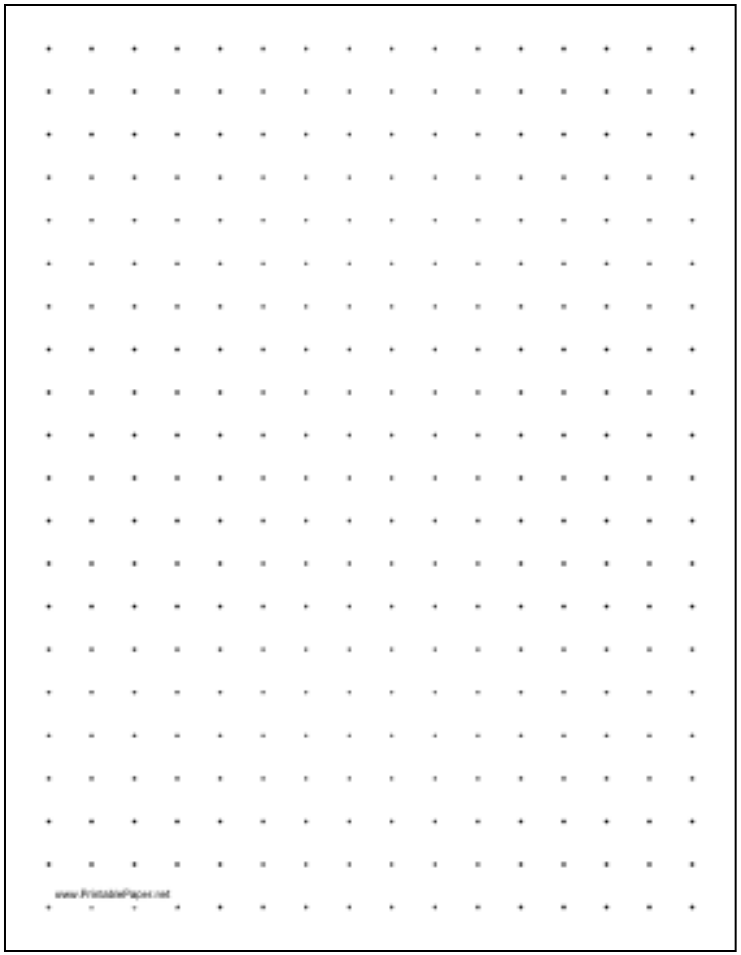
Indian Standards (IS) for drawing sheets and drawing boards as recommended by the Bureau of Indian Standards (BIS) are shown in Table 1.1.

Table 1.1 Recommended Sizes of Drawing Sheets and Drawing Boards

Drawing Sheet (IS 10711:2001)		*Drawing Board (IS 1444:1989)*	
Designation	*Size (mm) Length × Width*	*Designation*	*Size (mm) Length × Width*
A0	1189 × 841	D0	1270 × 920
A1	841 × 594	D1	920 × 650
A2	594 × 420	D2	650 × 470
A3	420 × 297	D3	500 × 350
A4	297 × 210		

Drawing Instruments

1. Grid Sheets:



Drawing Instruments

2. Lead Pencil (0.7 mm):

Fig. 1.9 Pencils

Fig. 1.10 Lead pen and lead box

Pencils/Lead Pens

The quality of drawing largely depends on the selection and use of proper grade of pencil. The grade of a pencil is printed near its blocked end.

There are total eighteen grades 9H, 8H, 7H, 6H, 5H, 4H, 3H, 2H, H, F, HB, B, 2B, 3B, 4B, 5B, 6B, 7B. 9H is the hardest and 7B is the softest.

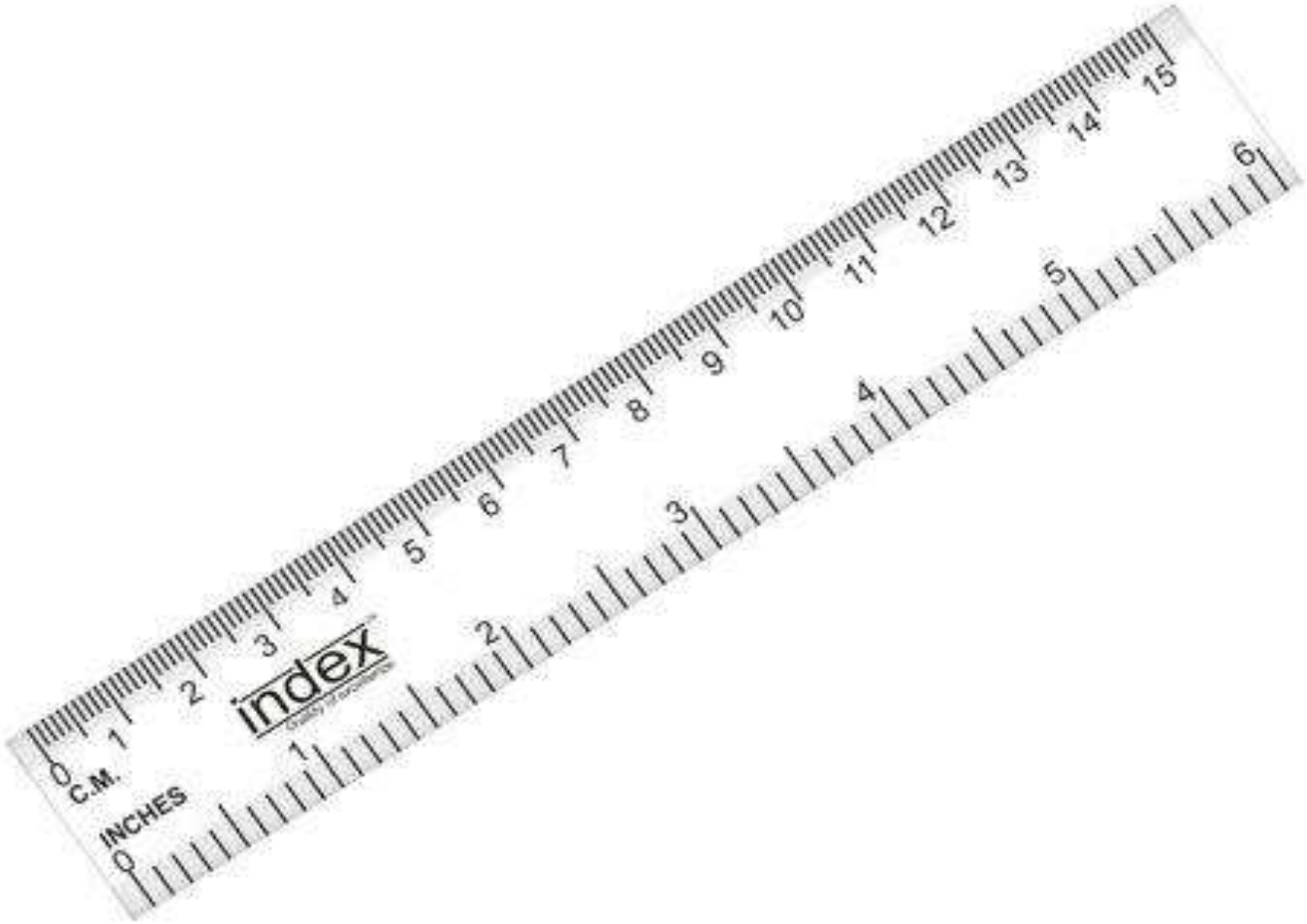
For technical drawing, three grades of pencils, namely, H, 2H and HB are recommended. A lead pen, Fig. 1.10, is an alternative to the pencil.

Drawing Instruments

3. Eraser:

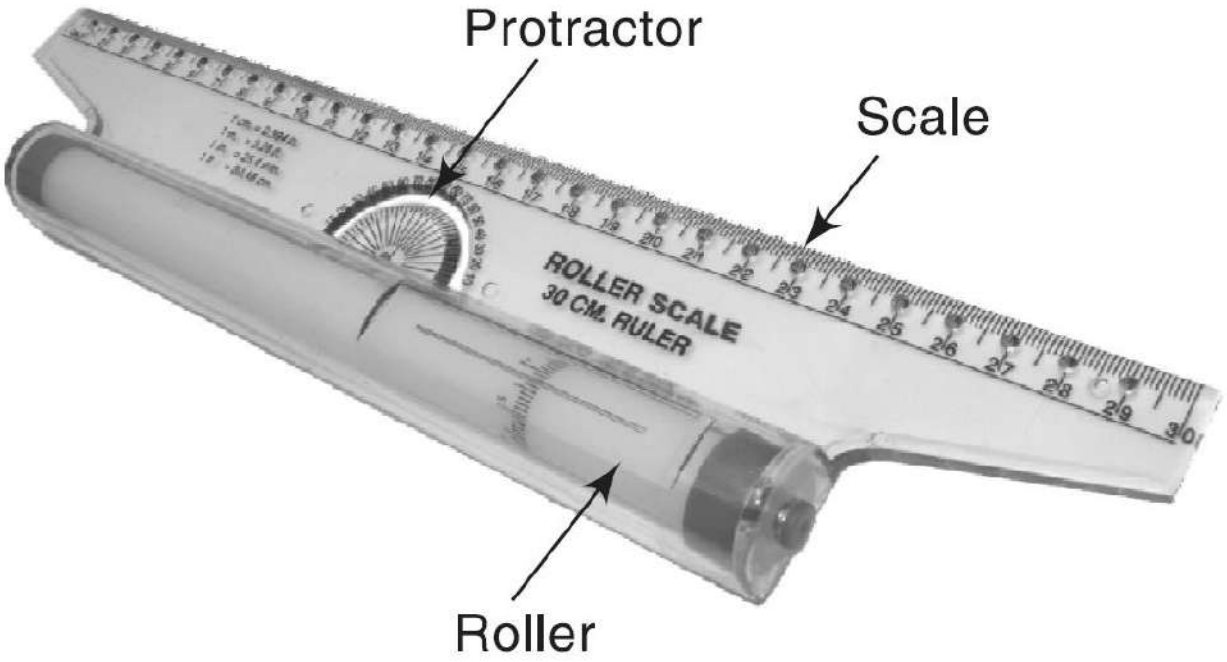
Drawing Instruments

4. Engineering scale 15cm (Plastic):



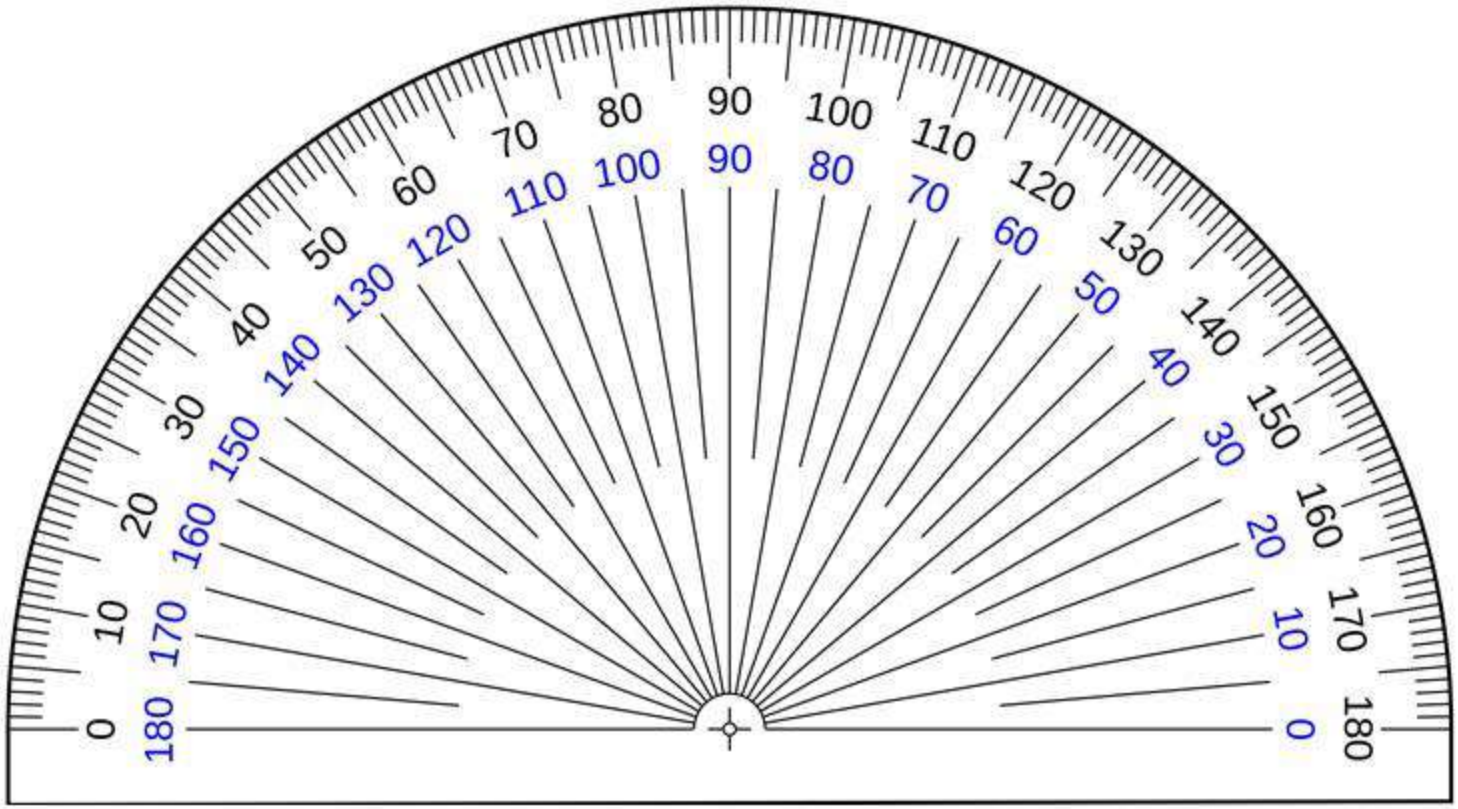
Drawing Instruments

5. Roller Scale 15cm:



Drawing Instruments

6. Protractor:



Drawing Instruments

7. Compass:

Thanks

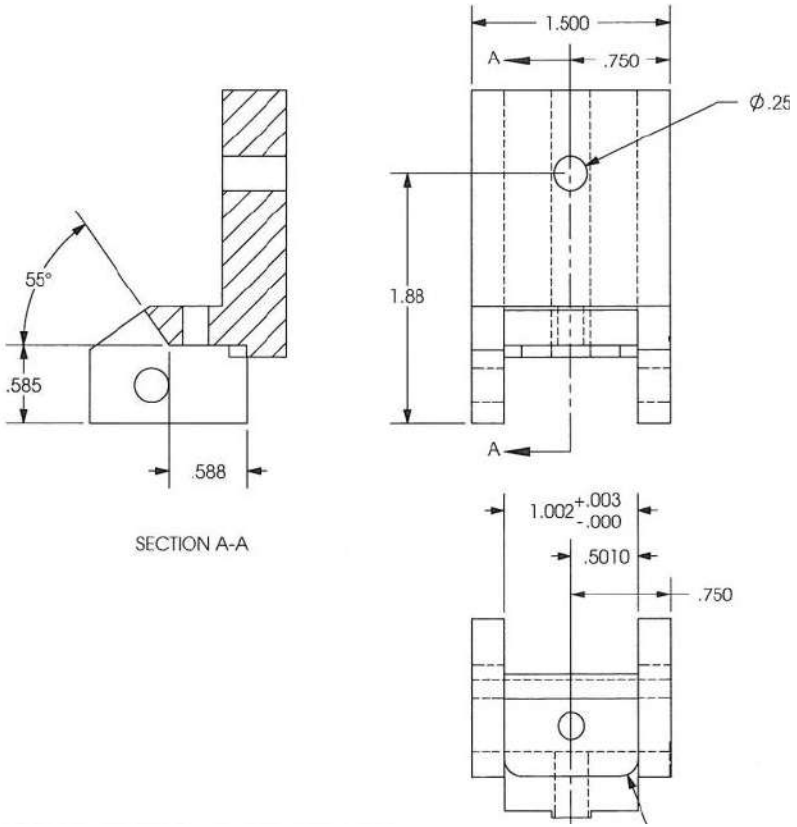
ENGINEERING DRAWING

Topic:
Line Types

Introduction to Lines

LINES

Lines are like the alphabet of a drawing language. Each line in a drawing is used in a specific sense.



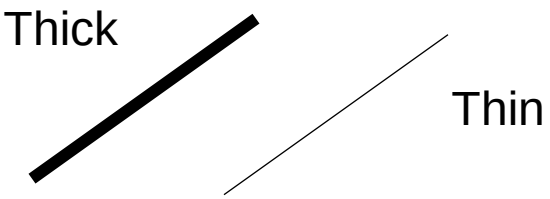
Introduction to Lines

Types of Lines

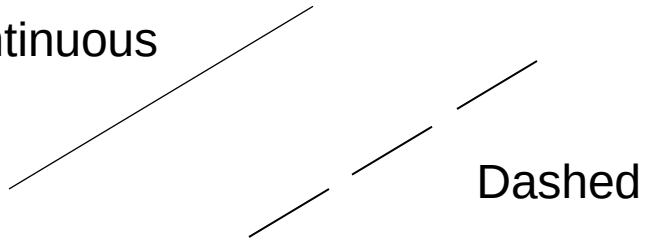
Lines differ from each other in two respects:

a) Their thickness or weight

eg:- Thick, medium & thin.

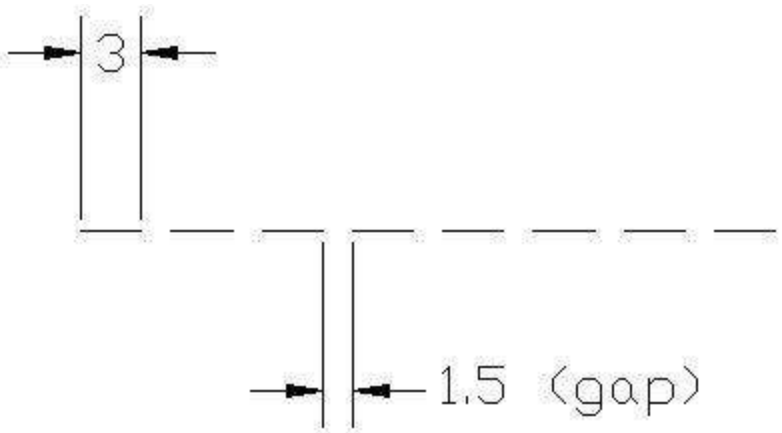


b) Their Shape or construction depending upon their conventional use.



Line Types

Sr.	Line Type	Representation	Width	Applications
1.	Continuous Thick Line	———	Thick	Visible Outlines Object Lines
2.	Continuous Thin Line	———	Thin	Construction lines Projection Lines Dimension Lines Extension Lines Section Lines Leader Lines
3.	Dashed Medium Line	- - - - - - - - - - - - - -	Medium	Hidden lines



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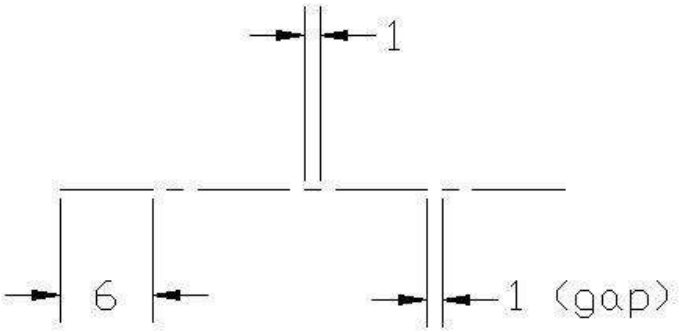
3.	Dashed Medium Line	- - - - - - - - - - - - - -	Medium	Hidden lines
4.	Chain Thin	—-—-—-—-—-—	Thin	Center lines Pitch circle dia



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3.	Dashed Medium Line		Medium	Hidden lines
4.	Chain Thin		Thin	Center lines Pitch circle dia
5.	Chain Thin, Thick at ends		Thin	Cutting Plane lines
6.	Long Dashed Double Dotted (Phantom)		Thin	Locus Lines

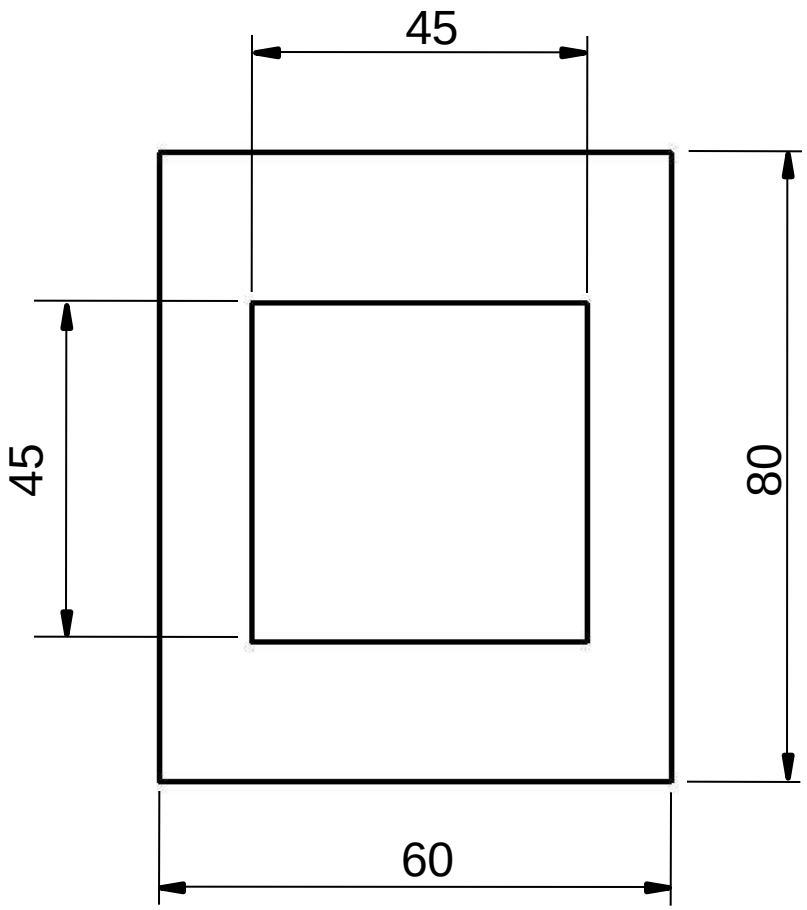
Thanks

ENGINEERING GRAPHICS

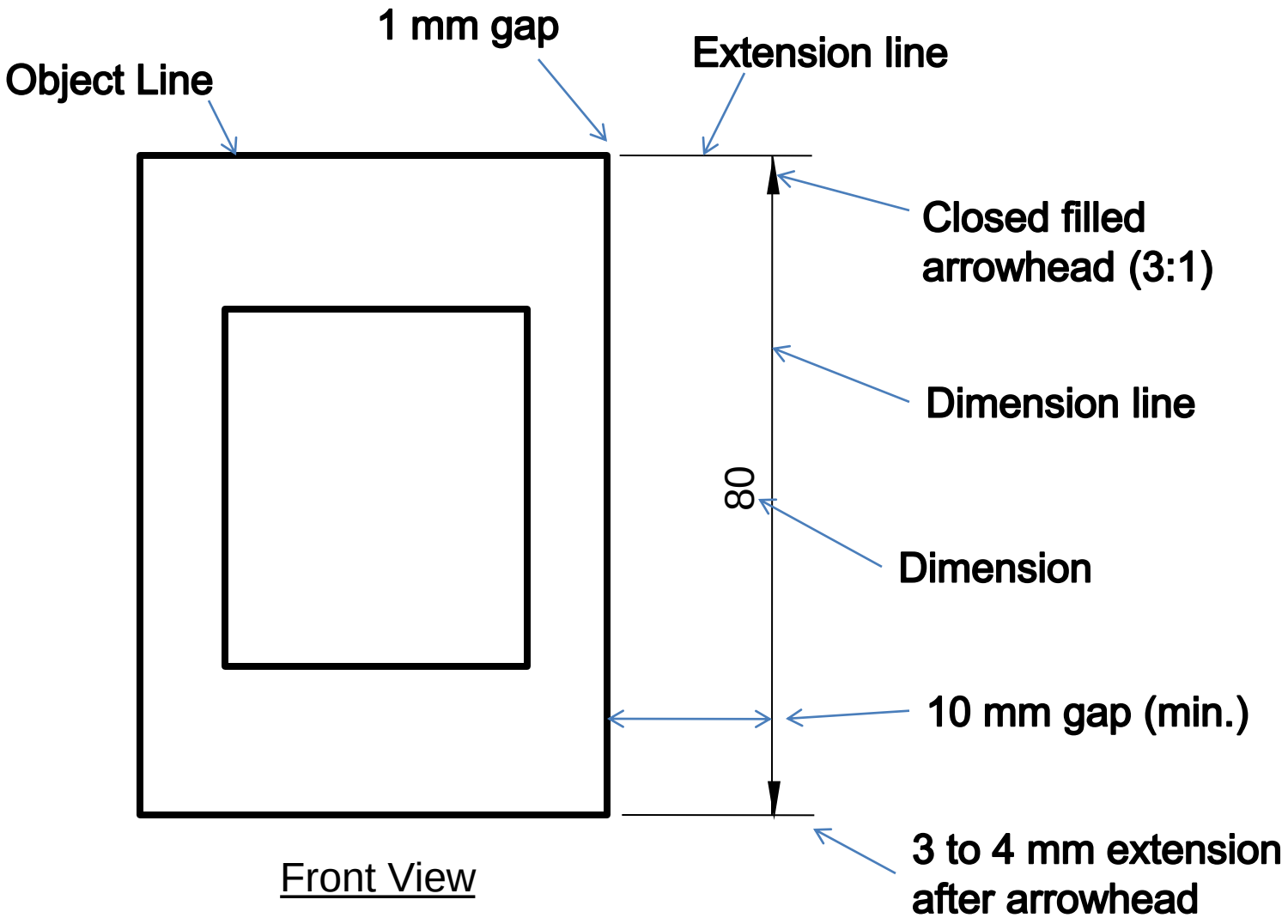
Topic:
Dimensioning

Dimensioning

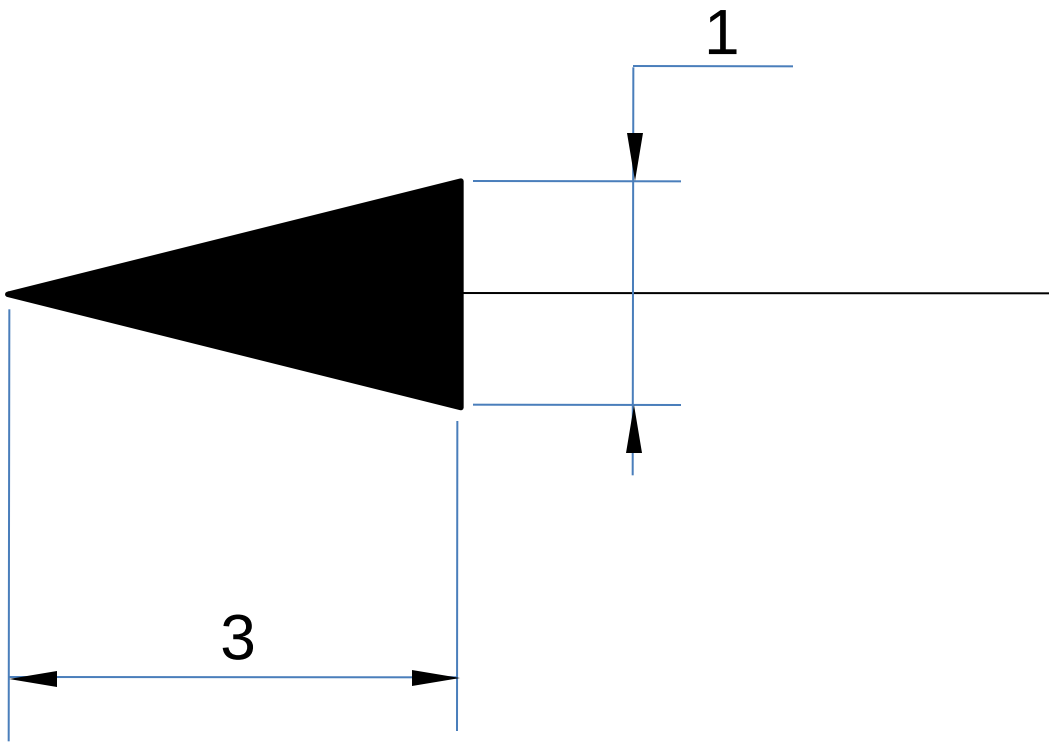
- ***Dimensioning*** **refers to the act of giving dimensions.**



Elements of Dimensioning

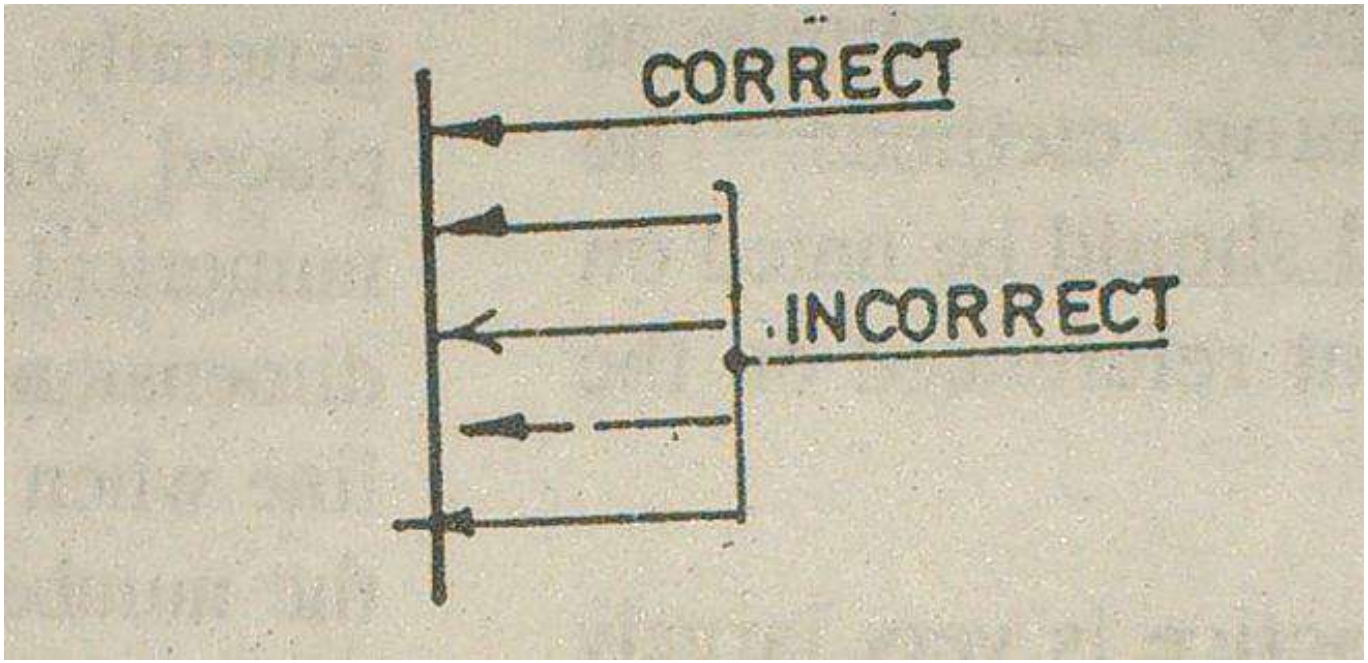


Closed filled arrowhead

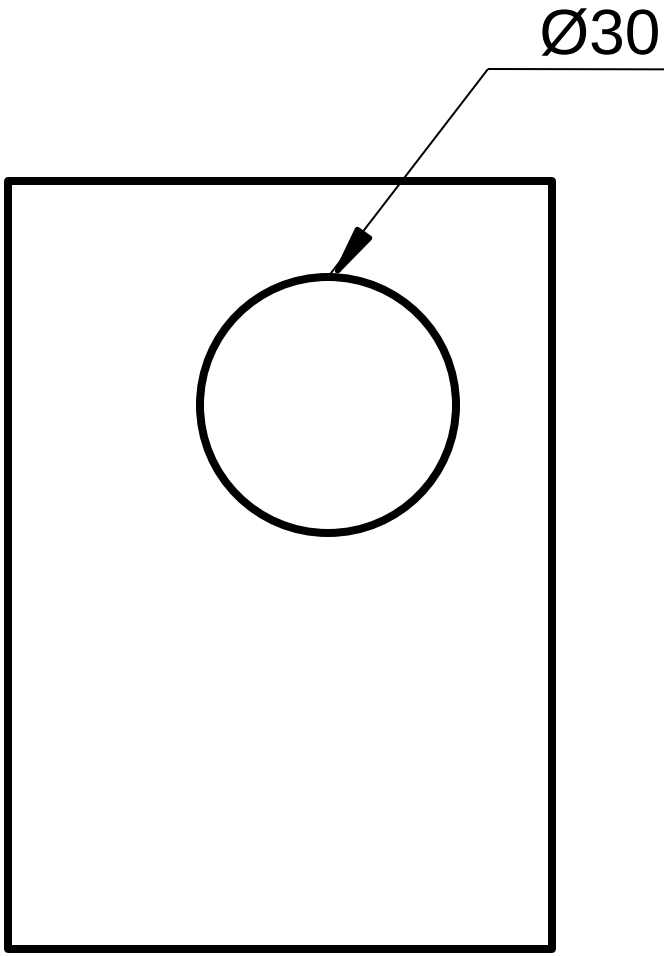


Closed filled arrowhead

Good & Bad Practices



Leader



Systems of Dimensioning

- There are two systems of dimensioning:

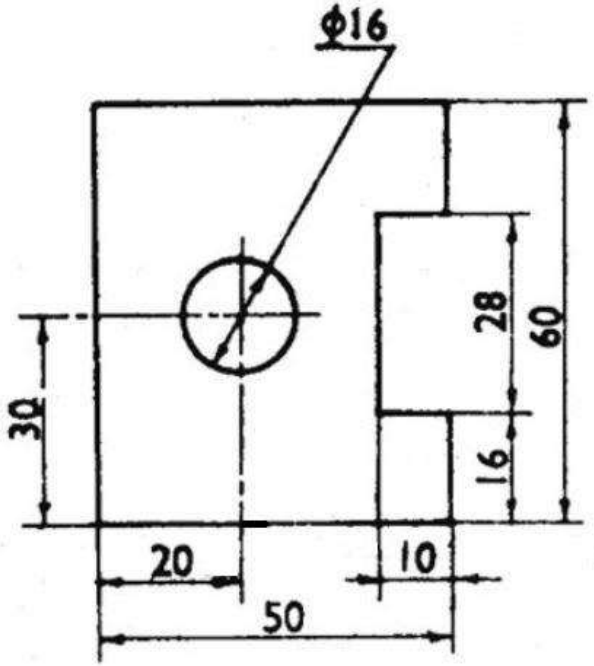
  a) Aligned System

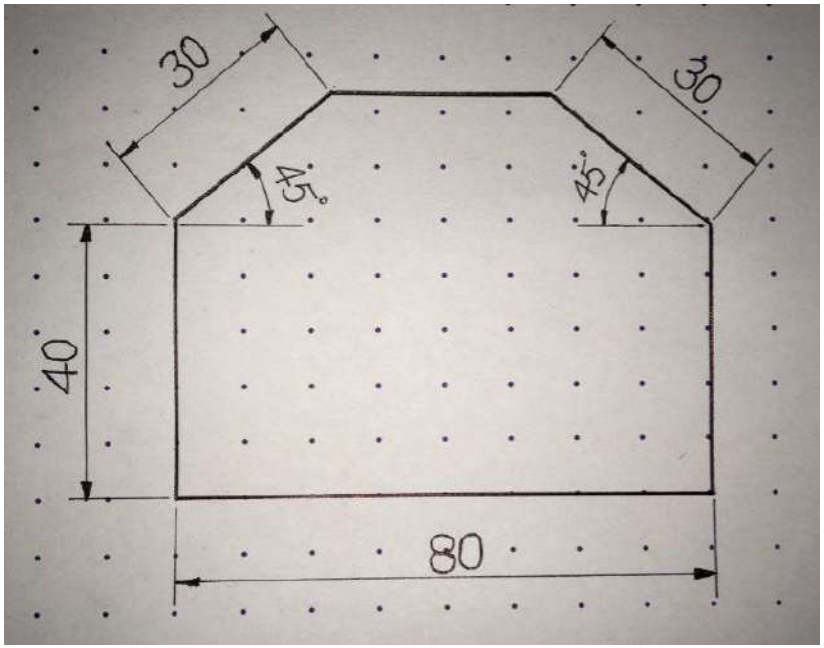
  b) Uni-directional System

Systems of Dimensioning

Aligned System

In the aligned system, dimensions are placed perpendicular to the dimension line so that they may be read from the bottom or right-hand side of the drawing sheet. Dimensions are placed at the middle and on top of the dimension lines.

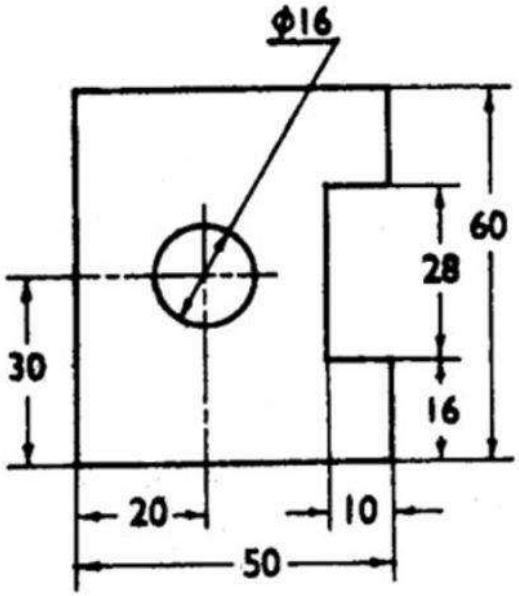


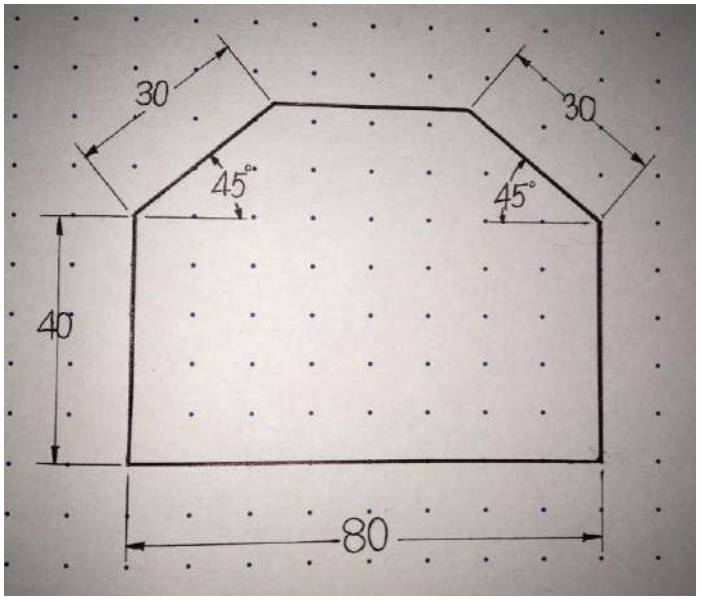


Systems of Dimensioning

Unidirectional System

In the unidirectional system, dimensions are placed in such a way that they can be read from the bottom edge of the drawing sheet. All dimensions are placed at the middle and are inserted by breaking the dimension lines at the middle.





Rule of Dimensioning

1. **Between any two extension lines, there must be one and only one dimension line bearing one dimension.**
2. **As far as possible, all the dimensions should be placed outside the views. Inside dimensions are preferred only if they are clearer and more easily readable.**
3. **All the dimensions on a drawing must be shown using either Aligned System or Unidirectional System. In no case should, the two systems be mixed on the same drawing.**
4. **The same unit of length should be used for all the dimensions on a drawing. The unit should not be written after each dimension, but a note mentioning the unit should be placed below the drawing.**
5. **Dimension lines should not cross each other. Dimension lines should also not cross any other lines of the object.**
6. **All dimensions must be given.**
7. **Each dimension should be given only once. No dimension should be redundant.**

Methods of Dimensioning

For dimensions in series, there are three methods:

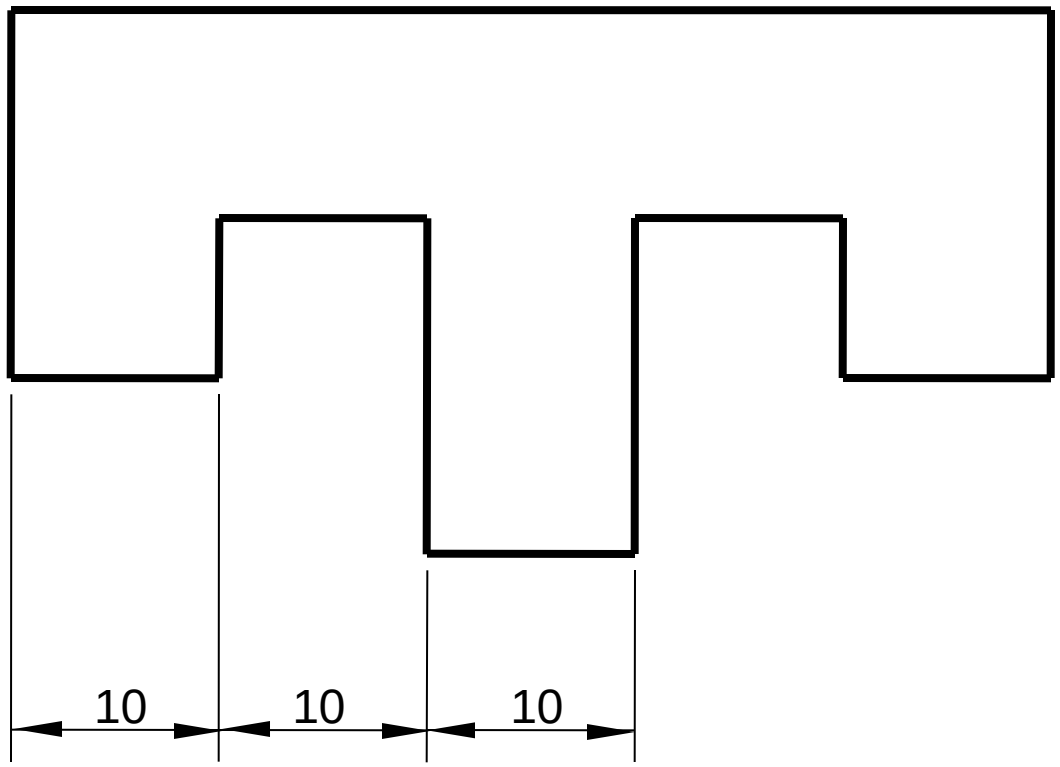
a) **Chain Dimensioning**
b) **Parallel Dimensioning**
c) **Combined Dimensioning**

Adopt any one of these methods.

i. **Chain dimensioning (Continuous dimensioning): All the dimensions are aligned in such a way that an arrowhead of one dimension touches tip-to-tip the arrowhead of the adjacent dimension. The overall dimension is placed outside the other smaller dimensions.**

Methods of Dimensioning

CHAIN DIMENSIONING



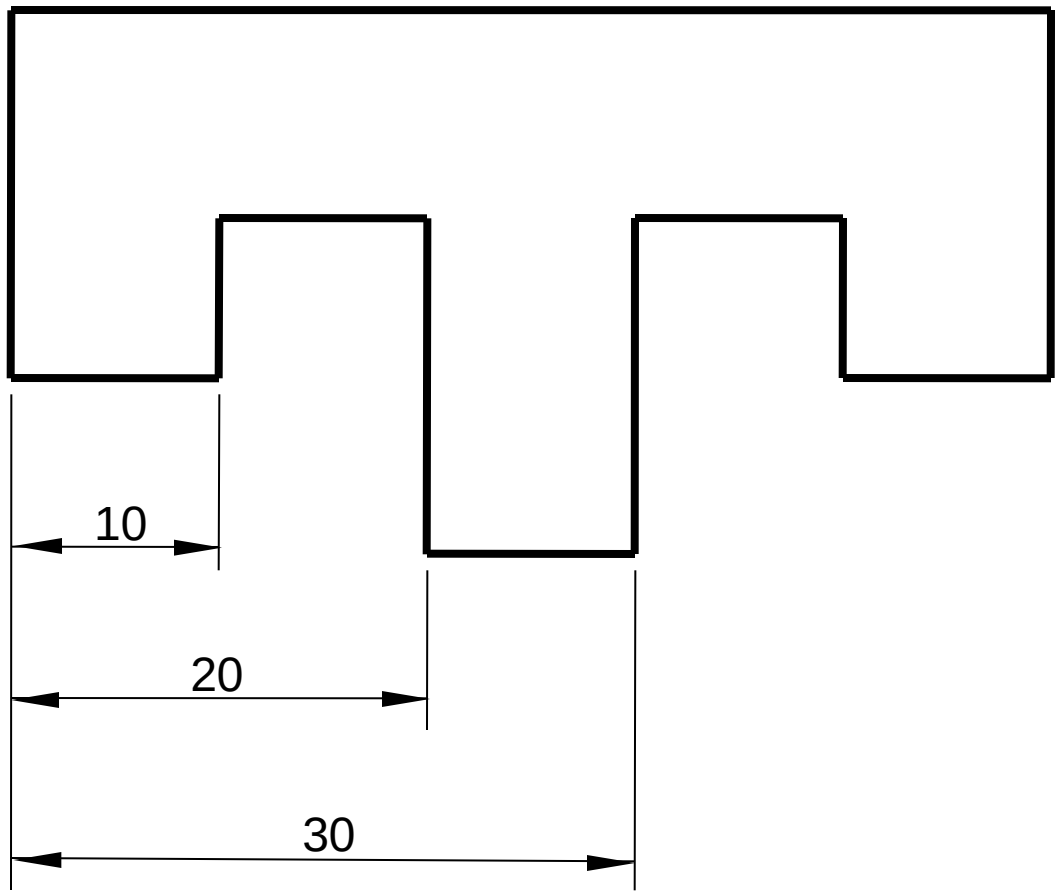
Methods of Dimensioning

Parallel dimensioning (Progressive dimensioning):

All the dimensions are shown from a common reference line. Obviously, all these dimensions share a common extension line. This method is adopted when dimensions have to be established from a particular datum surface.

Methods of Dimensioning

PARALLEL DIMENSIONING



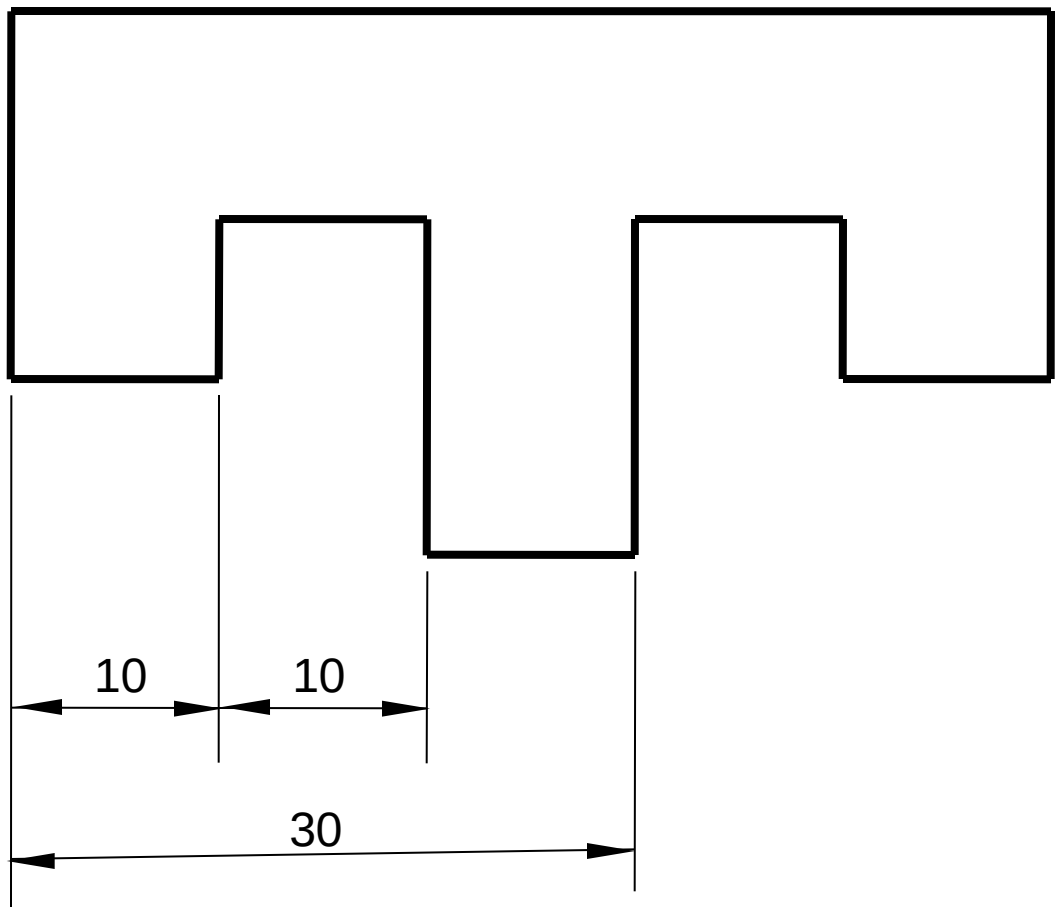
Methods of Dimensioning

Combined dimensioning:

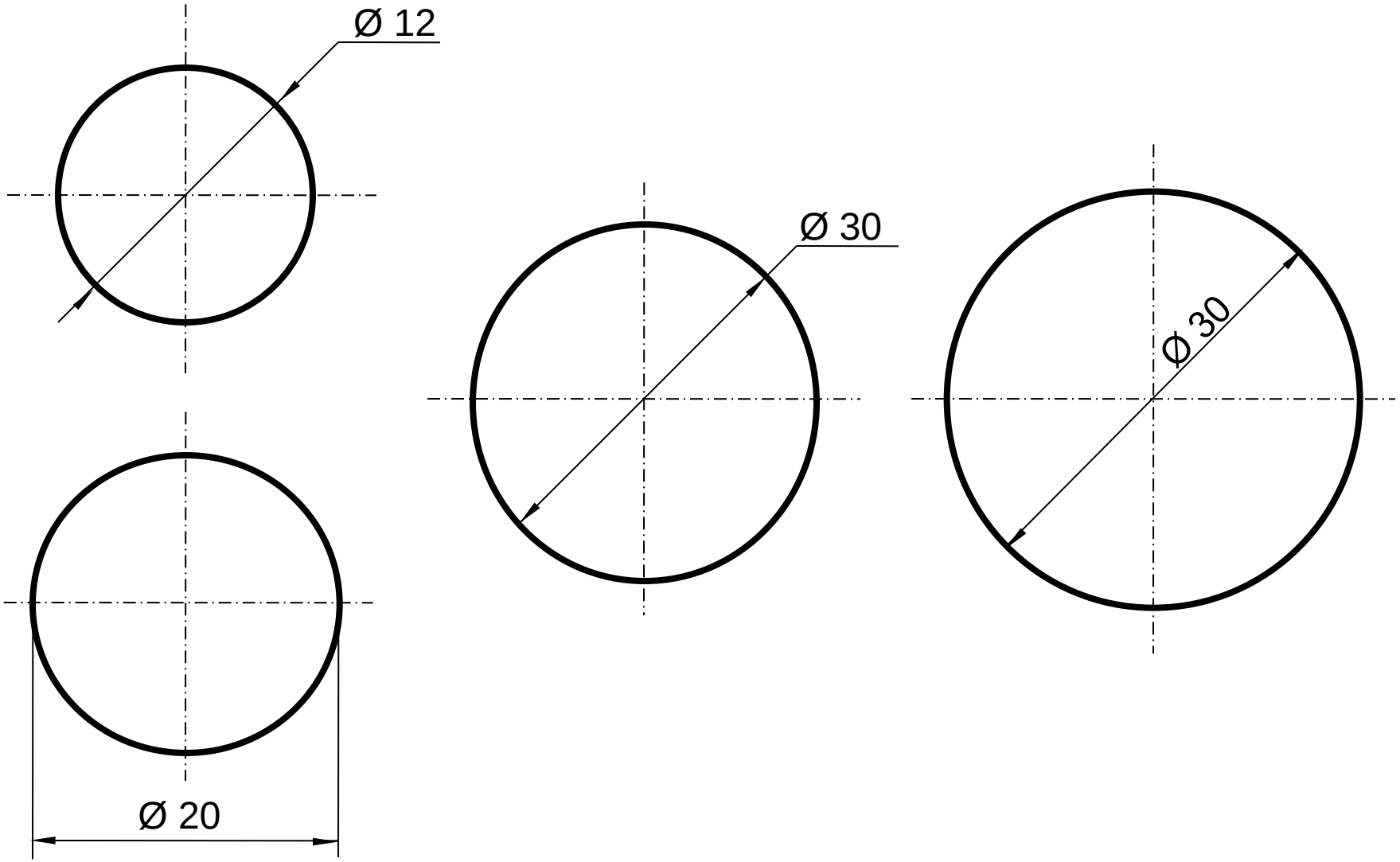
When both the methods, i.e., chain dimensioning and parallel dimensioning are used on the same drawing, the method of dimensioning is called combined dimensioning.

Methods of Dimensioning

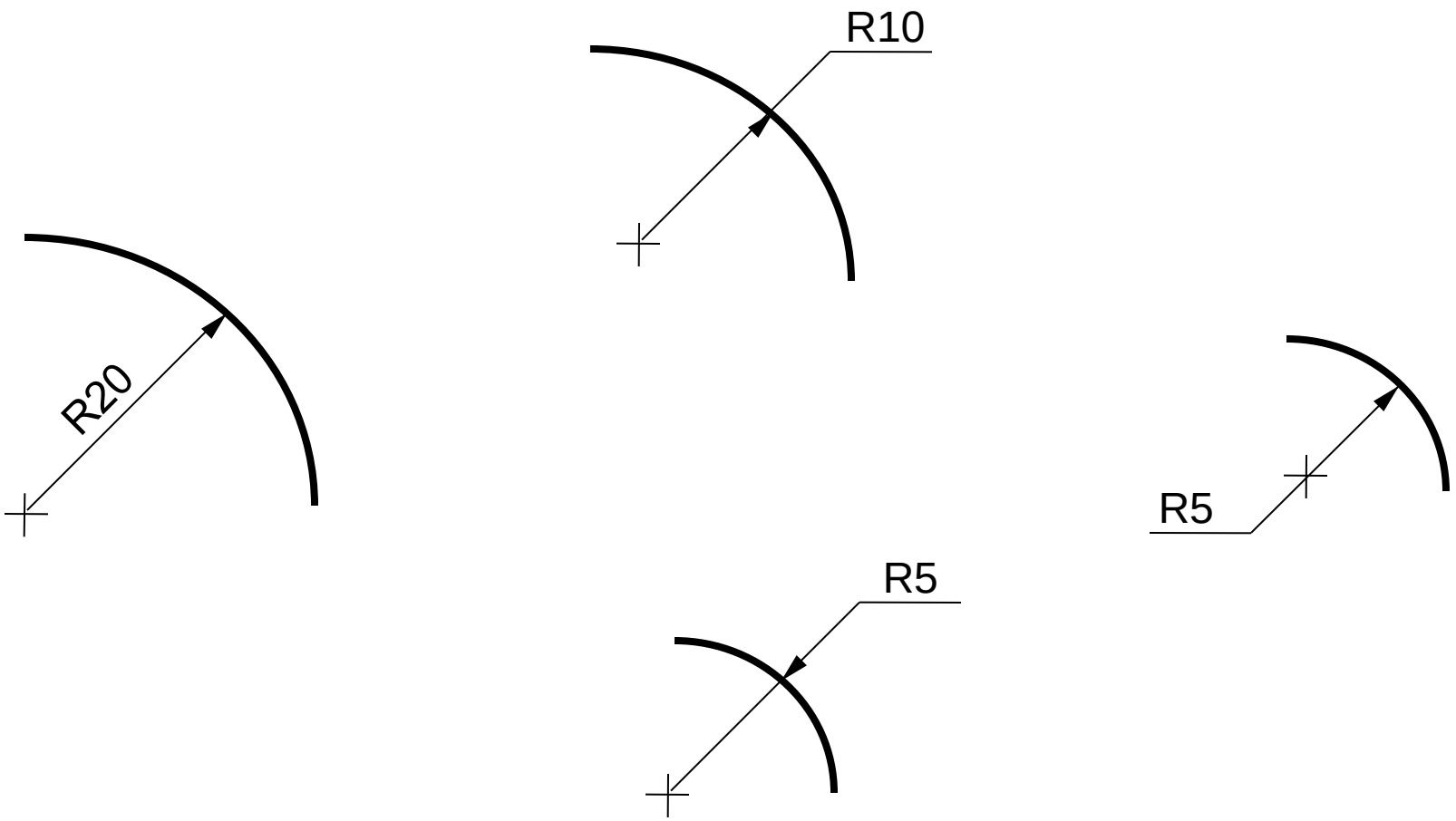
COMBINED DIMENSIONING



Dimensioning of Circular Features



Dimensioning of Circular Features

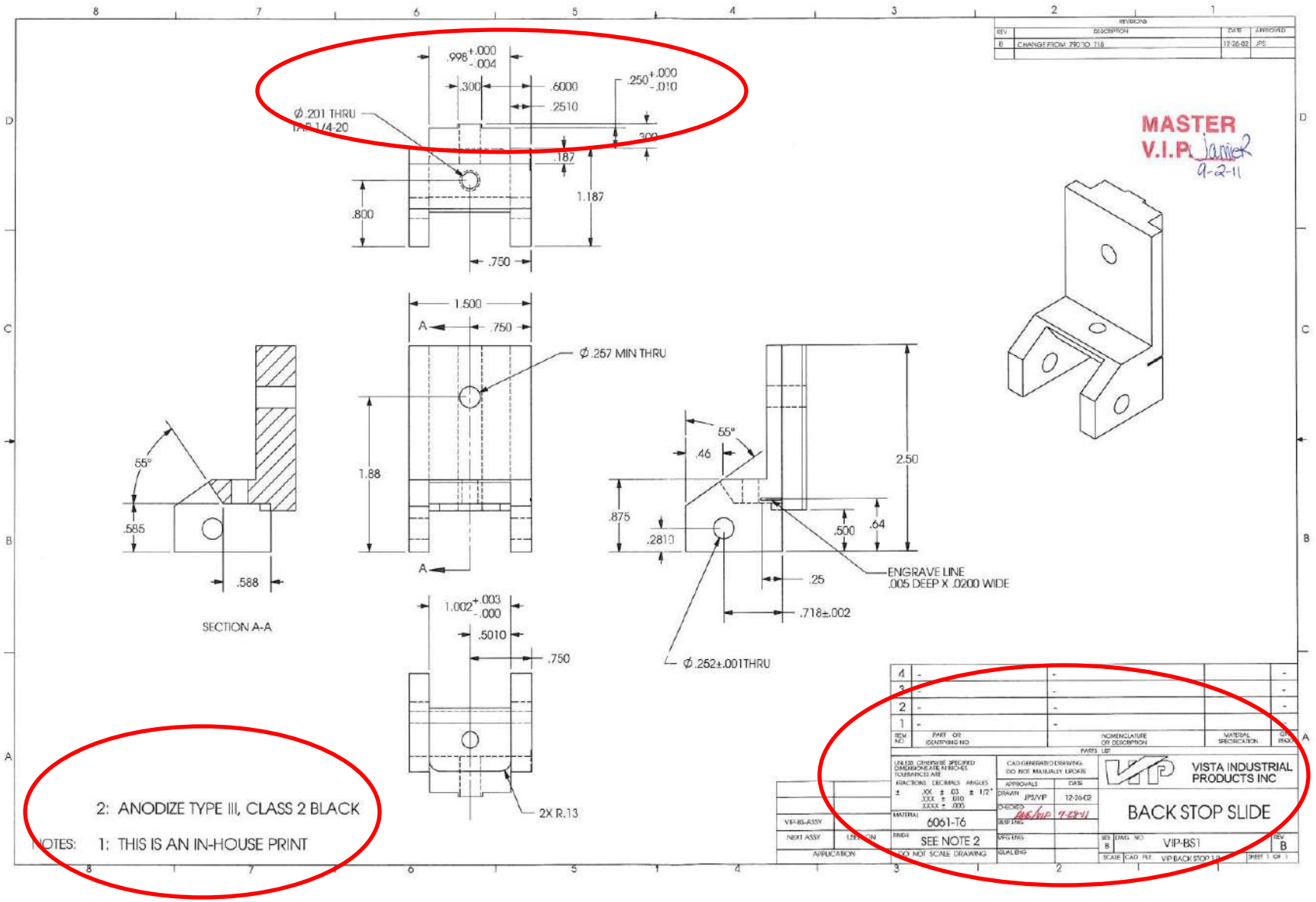


Thanks

ENGINEERING GRAPHICS

Topic:
Letter Writing

Letter Writing



Letter Writing

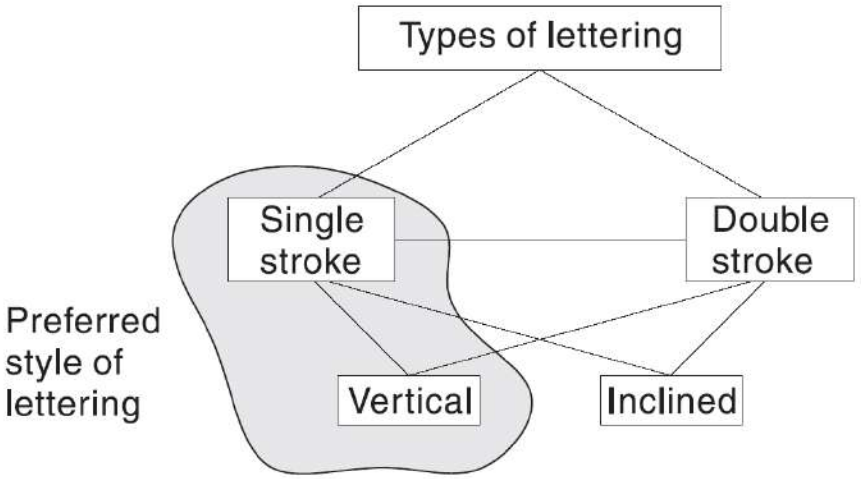
- **The written information on the drawings should be legible, neat in appearance and correct in style.**
- **So, all written information on the drawing is always in the form of lettering and not in handwriting.**
- **Letter writing is an art of writing text on a drawing by using alphabets, numerals and symbols.**

Letter Writing

Types of letter writing —

(1) Single stroke.

(2) Double stroke.



Gothic Letters

- **Single stroke letters are legible, neat in appearance and correct in style, therefore they are universally used for engineering drawings.**

- **Letters having all strokes of uniform thickness are classified as Gothic.**

- **The style of the letter, when the thickness of the strokes is such that it can be made with a single stroke of pencil, is called Single Stroke Gothic.**

Gothic Letters

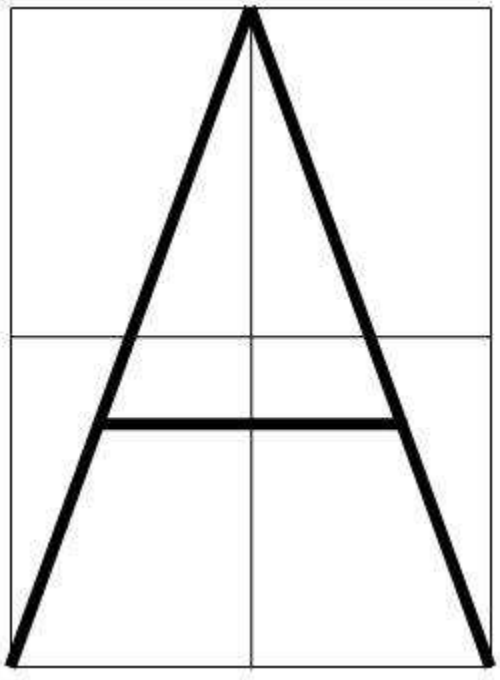
Single stroke vertical letters:

Letters are designated by their height.

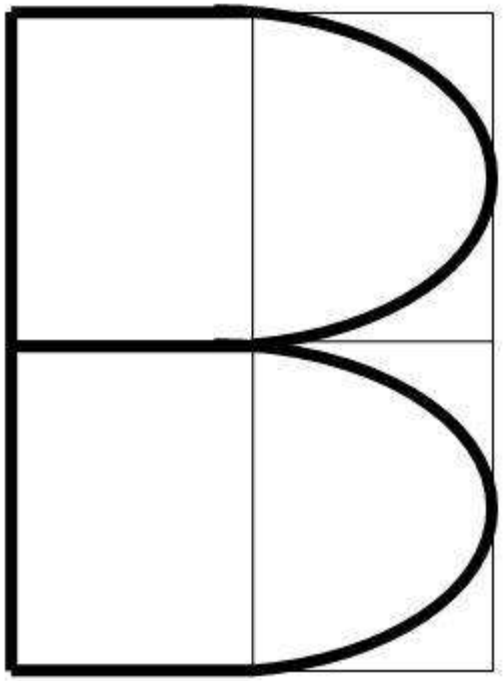
The ratio of height to width for single strike vertical gothic letters is given below.

SR.	HEIGHT TO WIDTH RATIO	LETTER/NUMERAL
1.	7:5	All letters except I, J, L, M, W
2.	7:4	All numerals except 1
3.	7:1	I
4.	7:3	1
5.	7:4	L & J
6.	7:6	M
7.	7:8	W

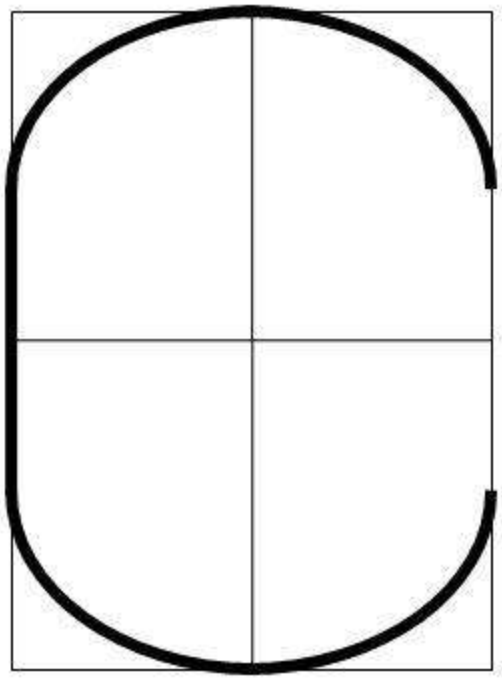
Gothic Letters



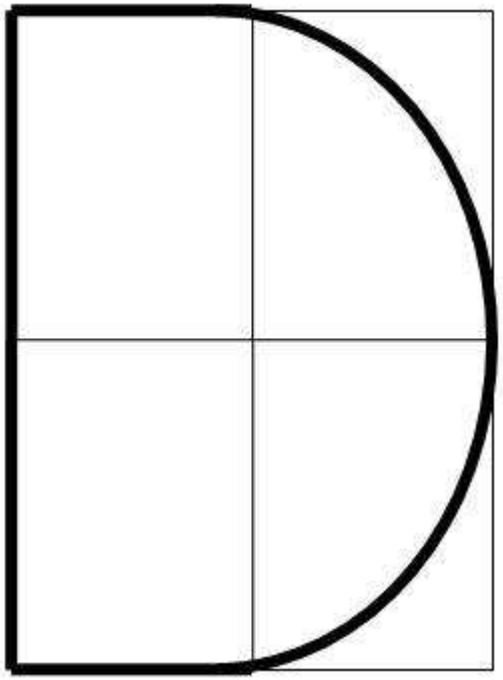
Gothic Letters



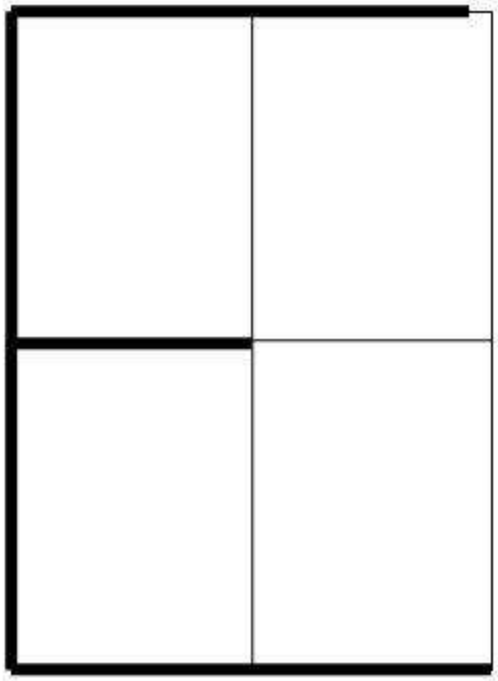
Gothic Letters



Gothic Letters



Gothic Letters



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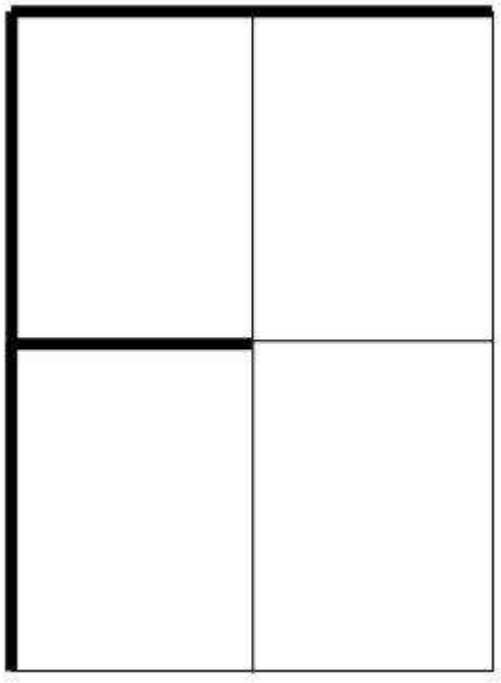

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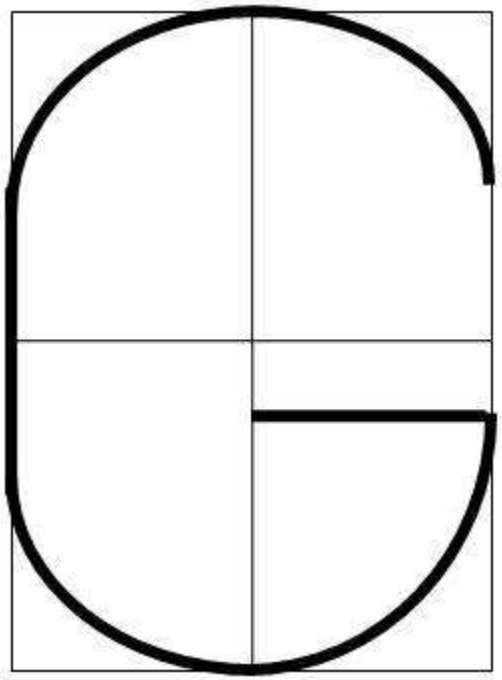
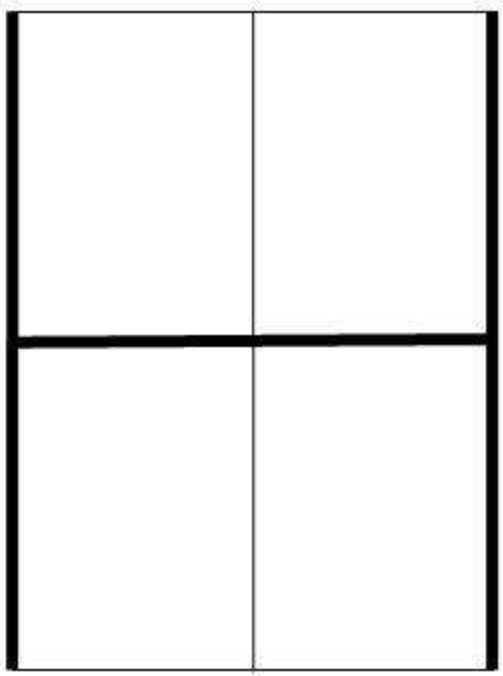
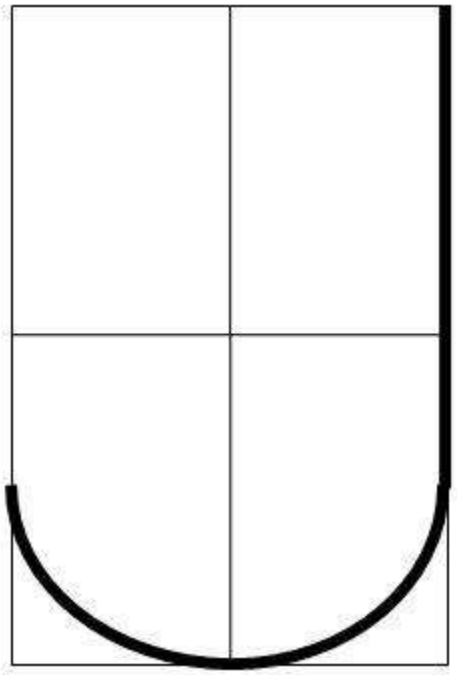


Gothic Letters



Gothic Letters

Gothic Letters



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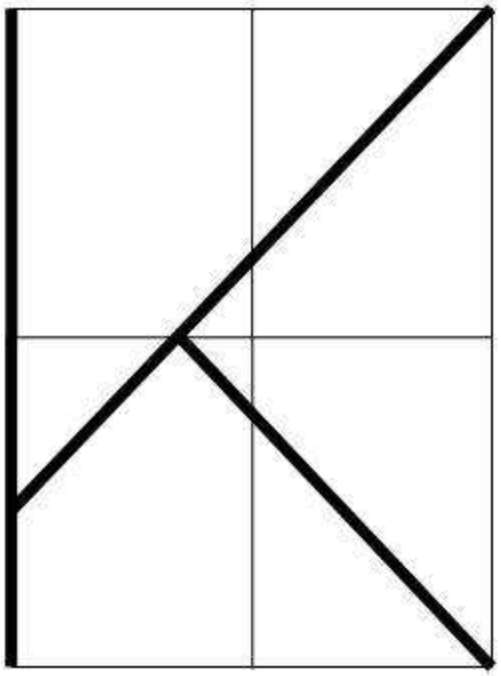
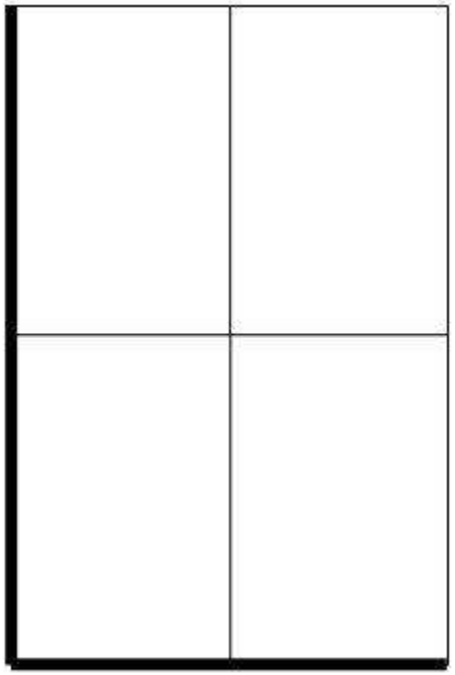


Gothic Letters



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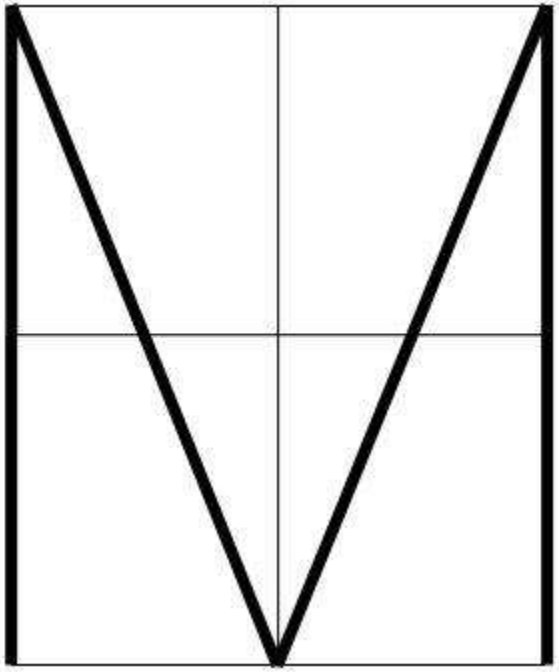
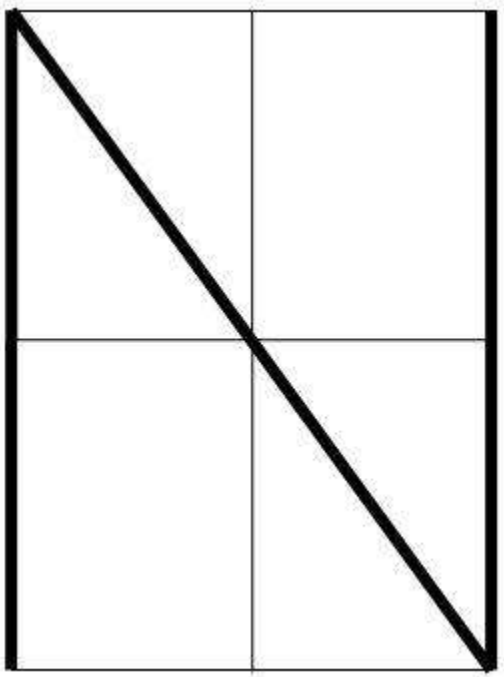
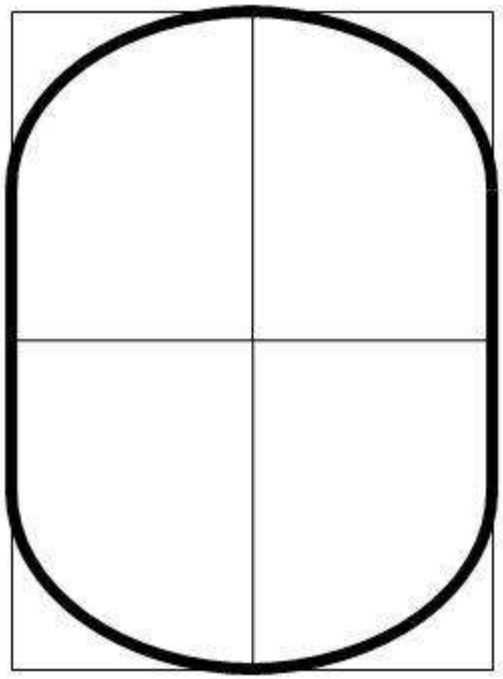


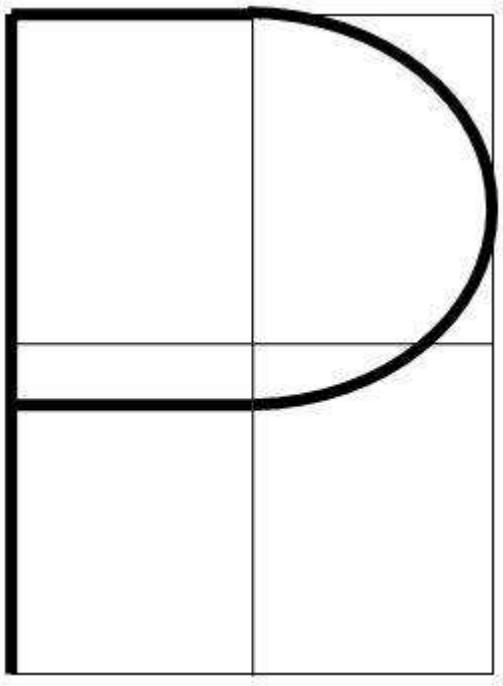
Gothic Letters



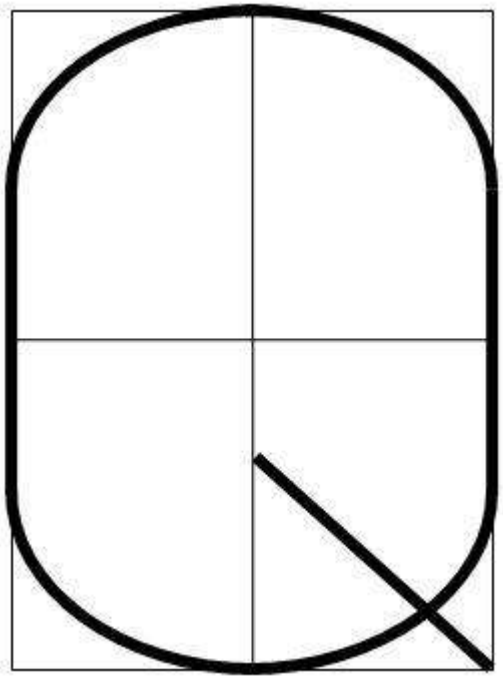
Gothic Letters



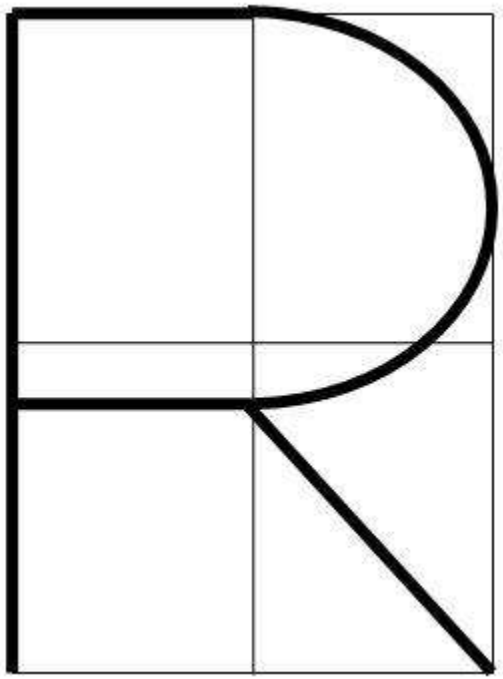
Gothic Letters



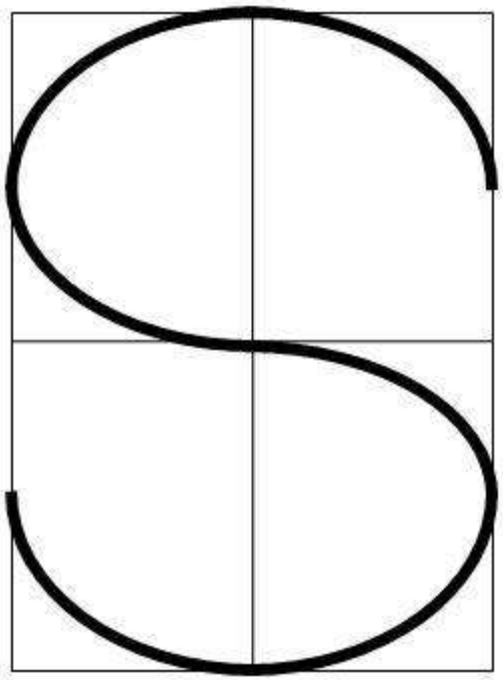
Gothic Letters



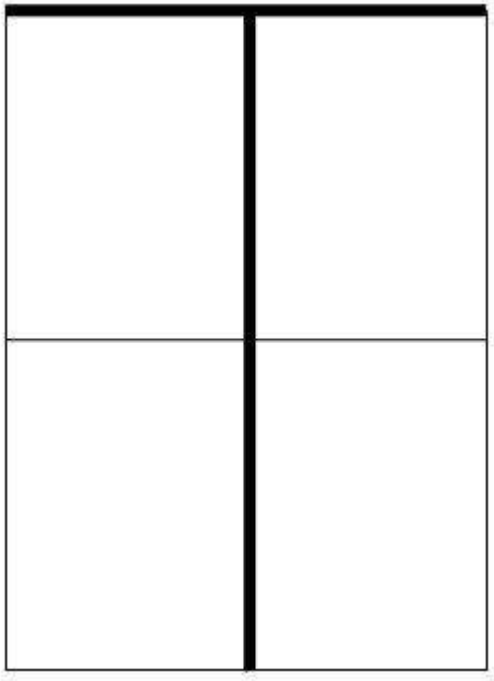
Gothic Letters



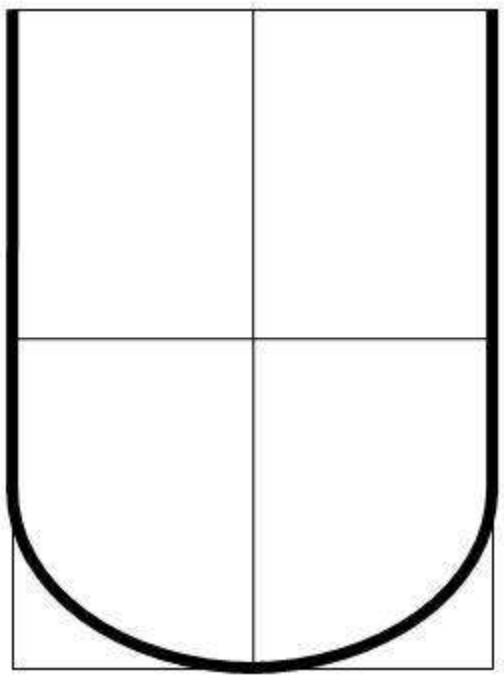
Gothic Letters



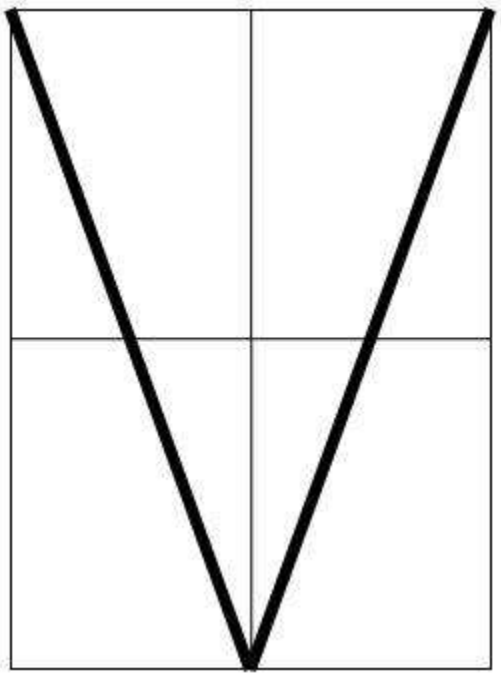
Gothic Letters



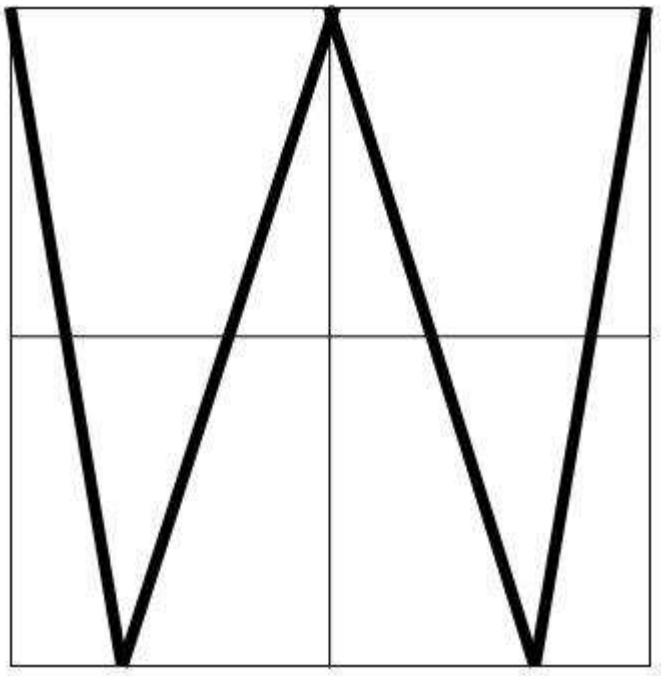
Gothic Letters



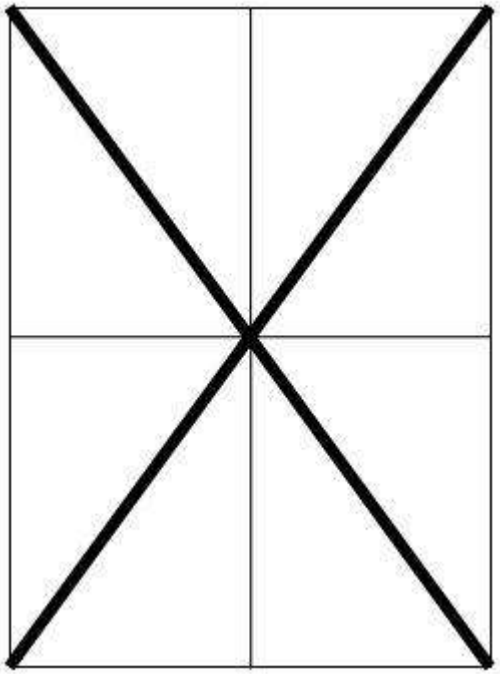
Gothic Letters



Gothic Letters



Gothic Letters



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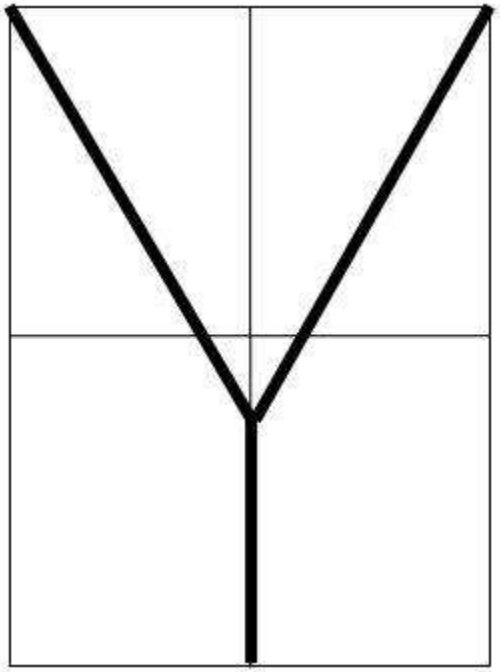

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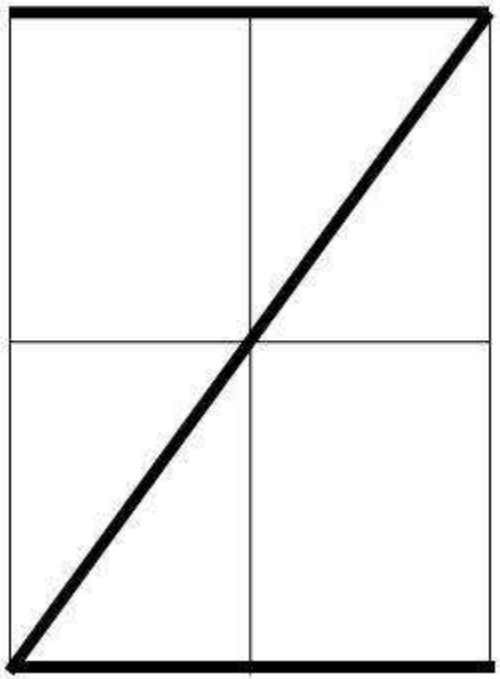

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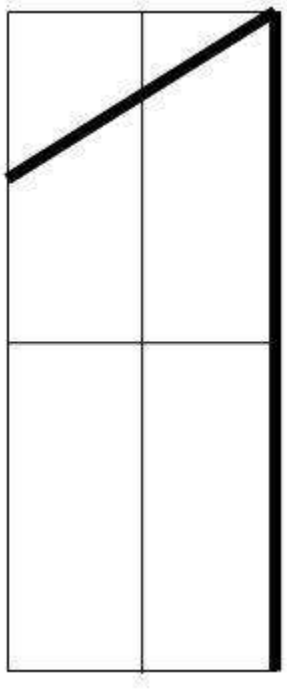

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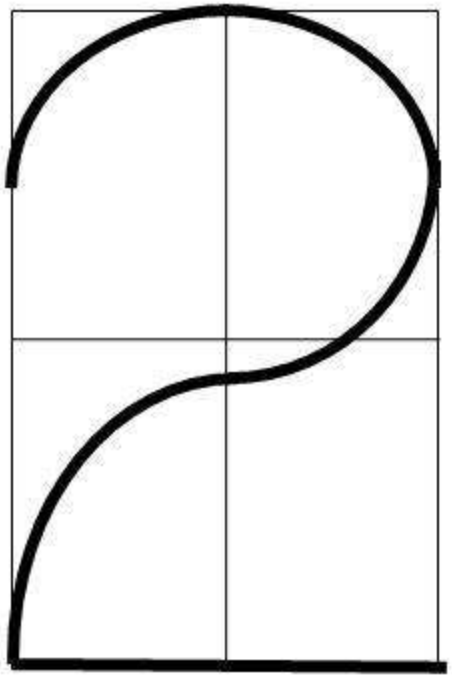

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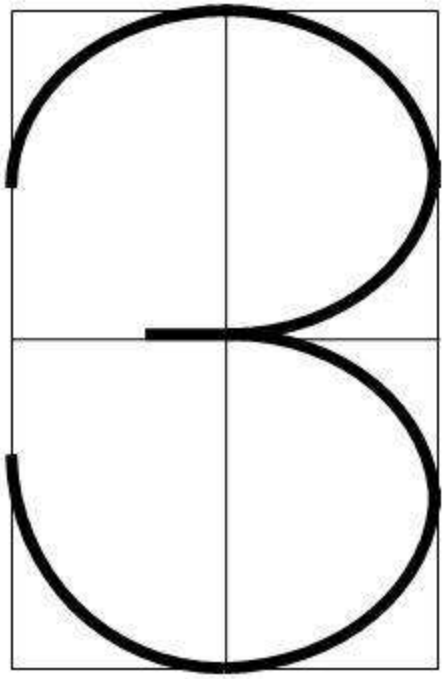
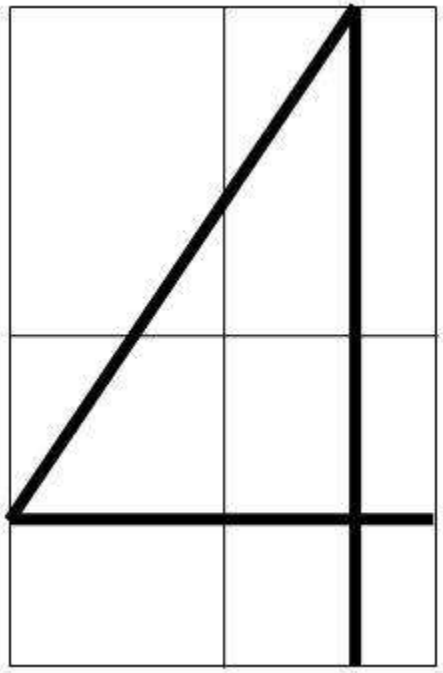


Gothic Letters



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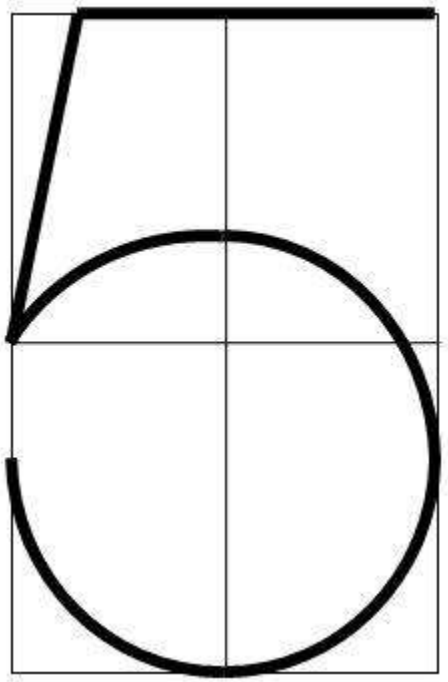
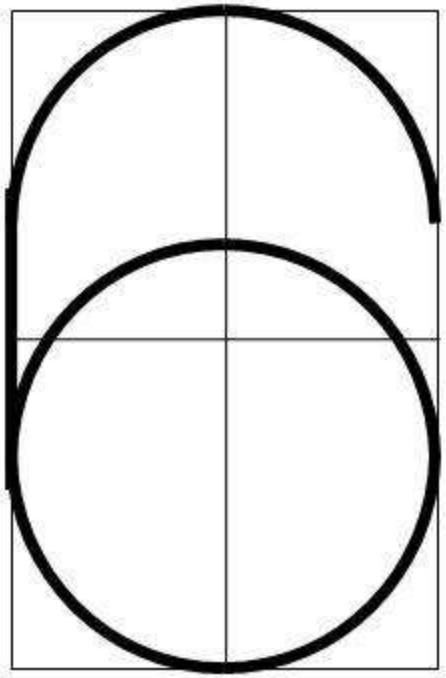


Gothic Letters



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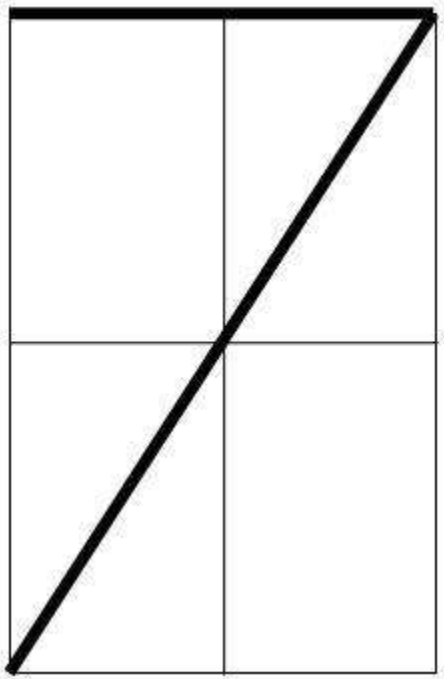
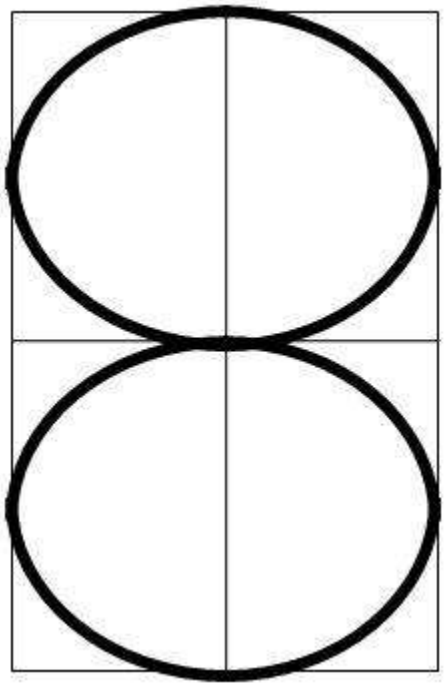
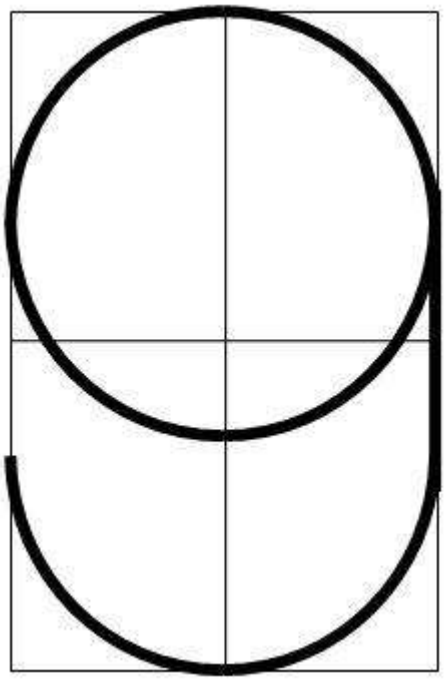


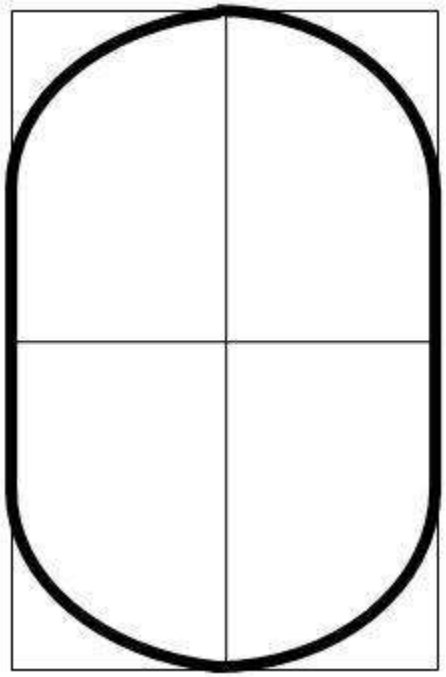
Gothic Letters



Gothic Letters



Gothic Letters



Rules of Letter Writing

1. The height of all the letters in one line should be the same.
2. The gap between two letters in a word should be 2 mm.
3. Words should be spaced one letter width apart and distance between two lines is equal to height of one letter.
4. They should appear upright from Bottom Edge, except when they are used for dimensioning.
5. Round-off the sharp corners wherever necessary, e.g., D, P, S, etc.
6. Letters and numerals are designated by their heights.


A B C D E F G H K N O P Q R S T U V X Y Z
L J M W I 2 3 4 5 6 7 8 9 0 1
THE QUICK BROWN FOX JUMPS OVER THE
LAZY DOG

Thanks

ENGINEERING GRAPHICS

Topic:
Scales

Scales

It is always possible or convenient to make the linear dimensions on a drawing the same size as the corresponding real dimensions on the object drawn. For eg. Drawing of a mobile phone.

Scales

Drawing of very big object, like aeroplane, must perforce, be drawn considerably smaller than the object so that the drawing can be read and handled with convenience.

Scales

Where as, details of small precision instruments, watches etc.; are made larger than their real size so that the drawing can be read clearly.

Scales

- **The proportion by which the drawing of a given object is enlarged or reduced is called the *scale* of the drawing.**

Representative Fraction

- **The scale of a drawing is indicated by a ratio, called the *Representative Fraction* (RF) or *Scale Factor*.**

$$RF = \frac{\text{Length of a line in the drawing}}{\text{Actual length of the line on the object}}$$

- **The terms ‘scale’ and ‘RF’ are synonymous. The scale is most commonly expressed in the format *X* :*Y* while RF is expressed in the format *X*/*Y*.**

Sizes of Scale

1. Reducing Scale.
2. Enlarging Scale.
3. Full Scale.

Sizes of Scale

1. Reducing Scale

When huge objects are to be drawn, they are reduced in size on the drawing. The scales used for these objects are called *reducing scales*. It is clear that the length of the object on the drawing is less than the actual length of the object. Reducing scales are mentioned in the format 1 :*Y*, where *Y* is greater than 1. Hence, RF < 1.

For eg:- 1:2 means drawing made to one HALF of the actual size.

Objects like multi-storeyed buildings, bridges, boilers, huge machinery, ships, aeroplanes, etc., are drawn to reducing scales.

Sizes of Scale

2. Enlarging Scale

When smaller objects are to be drawn, they often need to be enlarged. The scales used in such cases are called *enlarging scales*. Obviously, the length of an object on the drawing is more than the corresponding actual length of the object. Enlarging scales are mentioned in the format *X* : 1, where *X* is greater than 1. Clearly, RF > 1.

For eg: - 2:1 means drawing made to twice the actual size

Enlarging scales are used for objects like screws and gears used in small electronic gadgets, wristwatch parts, resistors, transistors, ICs.

Sizes of Scale

3. Full Scale

When an object is drawn on the sheet to its actual size, it is said to be drawn to *full scale*. As the length on the drawing is equal to the actual length of the object, the full scale is expressed as 1:1. Obviously, for full scale, RF = 1.

Full scales are used for objects like mobile phone, calculators, etc.

Types of Scale

1. Plain Scale or Simple Scale
2. Diagonal Scale

Conversions

1 Km	=	10 Hectometer
1 Hectometer	=	10 Decameter
1 Decameter	=	10 Meter
1 Meter	=	10 Decimeter
1 Decimeter	=	10 Centimeter
1 Centimeter	=	10 Millimeters

Types of Scale

1. **Plain Scale:**

   It is a line divided into suitable number of equal parts or units, the first part of which is subdivided into small parts.

   It represents either 2 main units or 1 unit and its sub division (fractions).

   It can measure lengths up to 1 decimal place. (eg: 3.5 m, 2.7 cm)

Types of Scale

2. Diagonal Scale:

In diagonal scale the smallest unit on plain scale is further subdivided by using diagonal principle.

It represents either 3 units or only one unit and its fractions up to second place of decimal point.

It can measure lengths upto 2 decimal place. (eg: 3.56 m, 2.78 cm)

Problem 1

Construct a Plain Scale to show meters & decimeters when 1 m is represented by 2.5 cm. The scale should be long enough to measure up to 6 m. Mark off 3.3 m & 5.6 m on the scale.

1. Calculate Representative Factor,

$$RF = \frac{\text{Length of a line in the drawing}}{\text{Actual length of the line on the object}} = \frac{2.5\text{ cm}}{1\text{ m}}$$

$$RF = \frac{2.5\text{ cm}}{1 \times 100\text{ cm}} = \frac{1}{40}$$

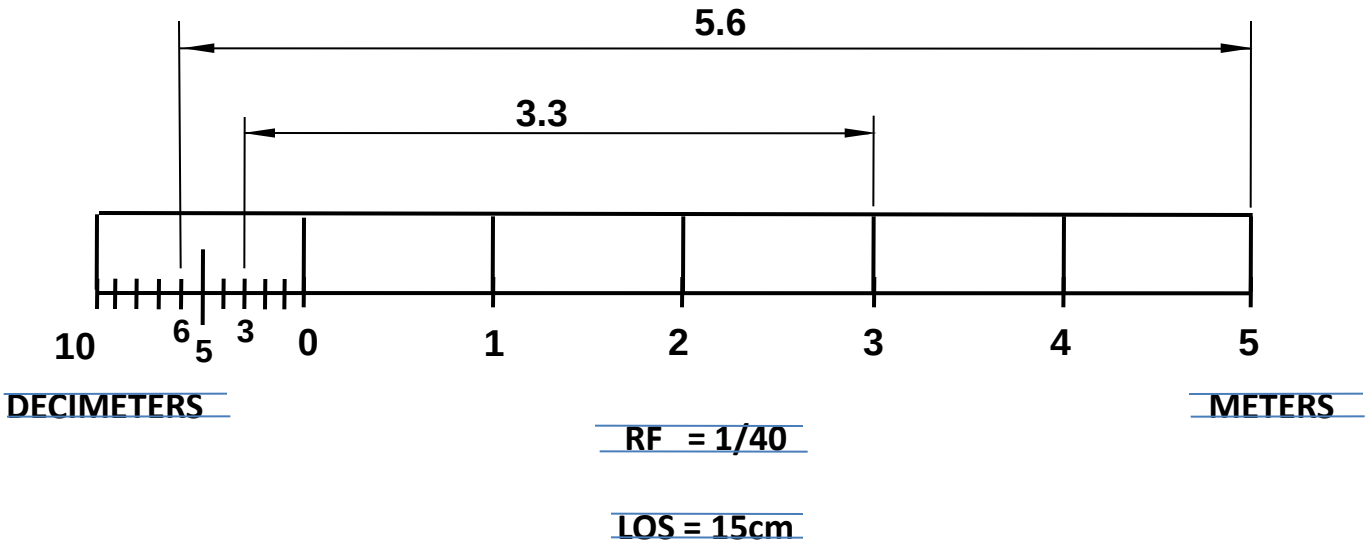
2. Calculate length of scale (L.O.S),

LOS = RF x Maximum length of scale = 1/40 x 6 m = 1/40 x 600 cm

= 15 cm

Problem 1

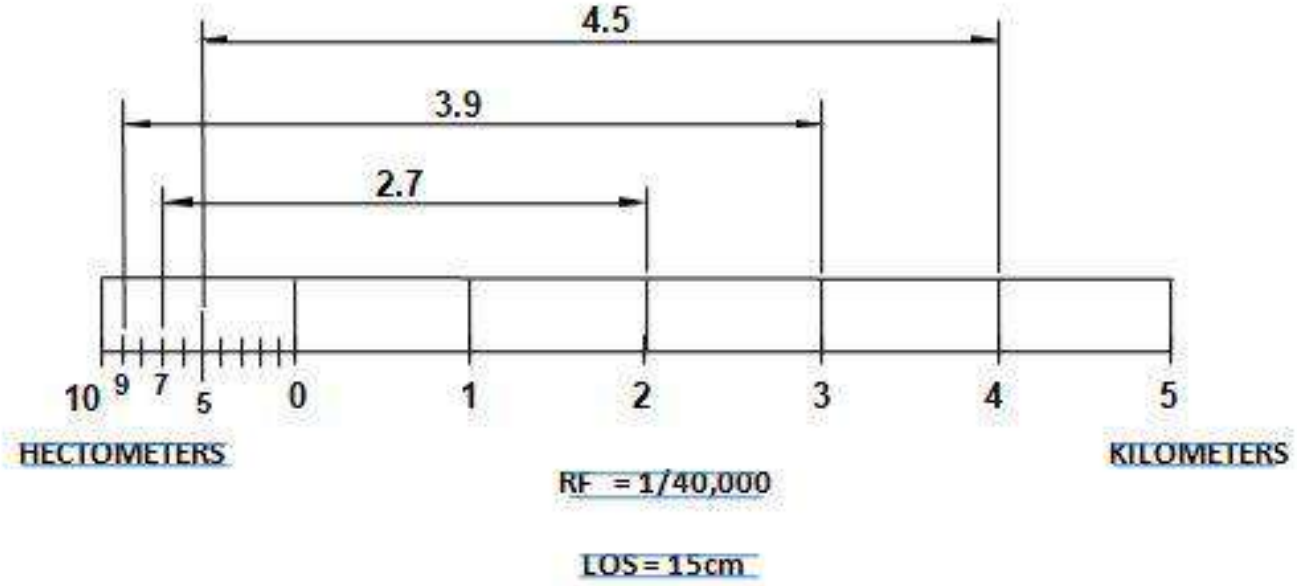
Construct a Plain Scale to show meters & decimeters when 1 m is represented by 2.5 cm. The scale should be long enough to measure up to 6 m. Mark off 3.3 m & 5.6 m on the scale.



Problem 2

Q 2. Construct a Plain Scale to show kilometers & hectometers when 2.5 cm is equal to 1 km. The scale should be long enough to measure up to 6 km. Mark off 2.7 km, 3.9 km & 4.5 km on the scale.

1. RF = 2.5 cm/1 km = 2.5/100000 = 1/40000
2. L.O.S = (1/40000) X 6 km
   = (1/40000) X 6 X 100000 cm
   = 15 cm



Problem 3

Construct a diagonal scale to show meters, decimeters & centimeters when 1 m is represented by 5 cm. Consider maximum length of scale as 4 m. Mark off 2.58 m & 3.09 m.

1. Calculate Representative Factor,

$$RF = \frac{\text{Length of a line in the drawing}}{\text{Actual length of the line on the object}} = \frac{5\text{ cm}}{1\text{ m}}$$

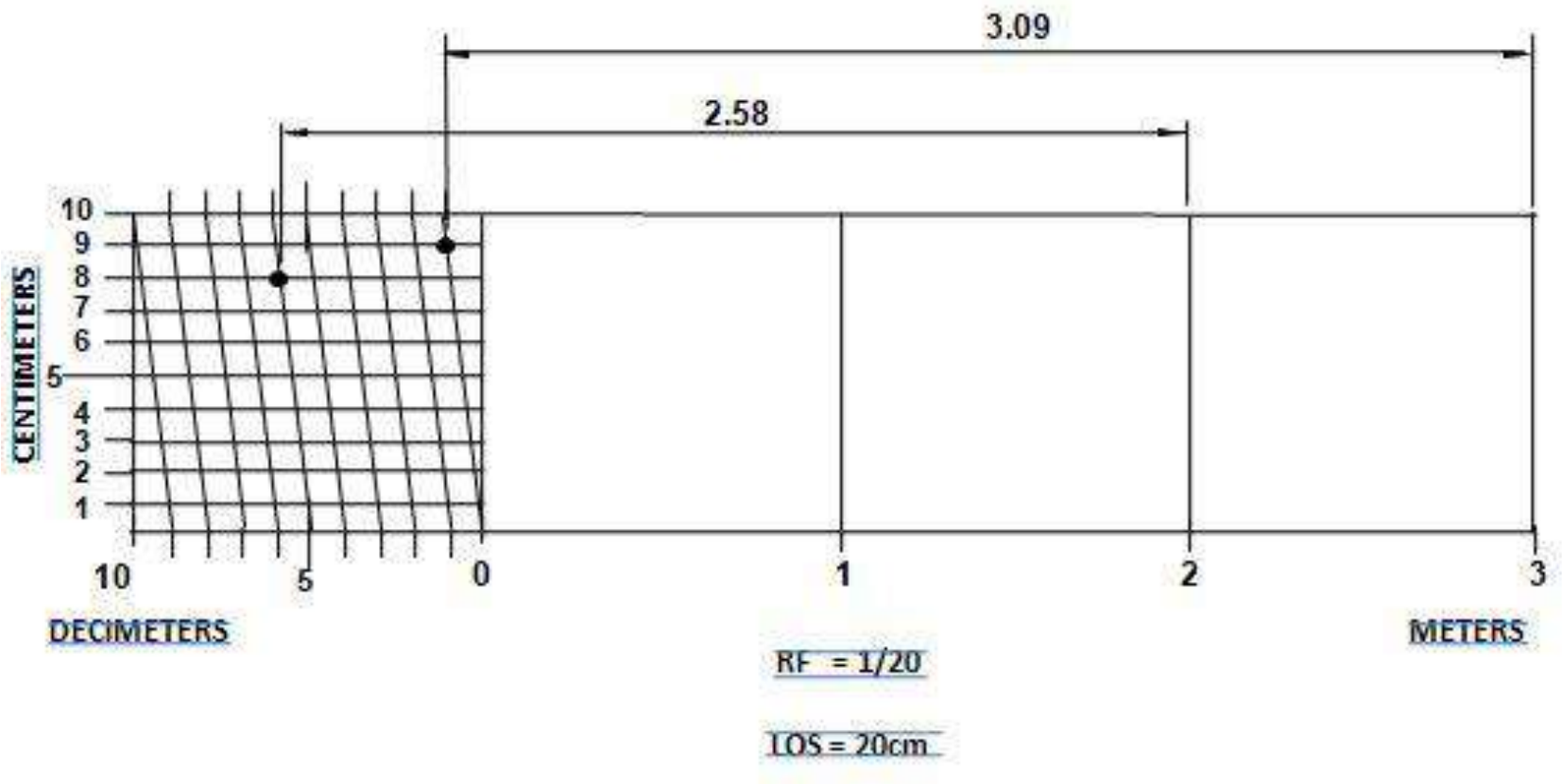
$$RF = \frac{5\text{ cm}}{1 \times 100\text{ cm}} = \frac{1}{20}$$

2. Calculate length of scale (L.O.S),

LOS = RF x Maximum length of scale = 1/20 x 4 m
= 1/20 x 4 x 100 cm
= 20 cm

Problem 3

Construct a diagonal scale to show meters, decimeters & centimeters when 1 m is represented by 5 cm. Consider maximum length of scale as 4 m. Mark off 2.58 m & 3.09 m.

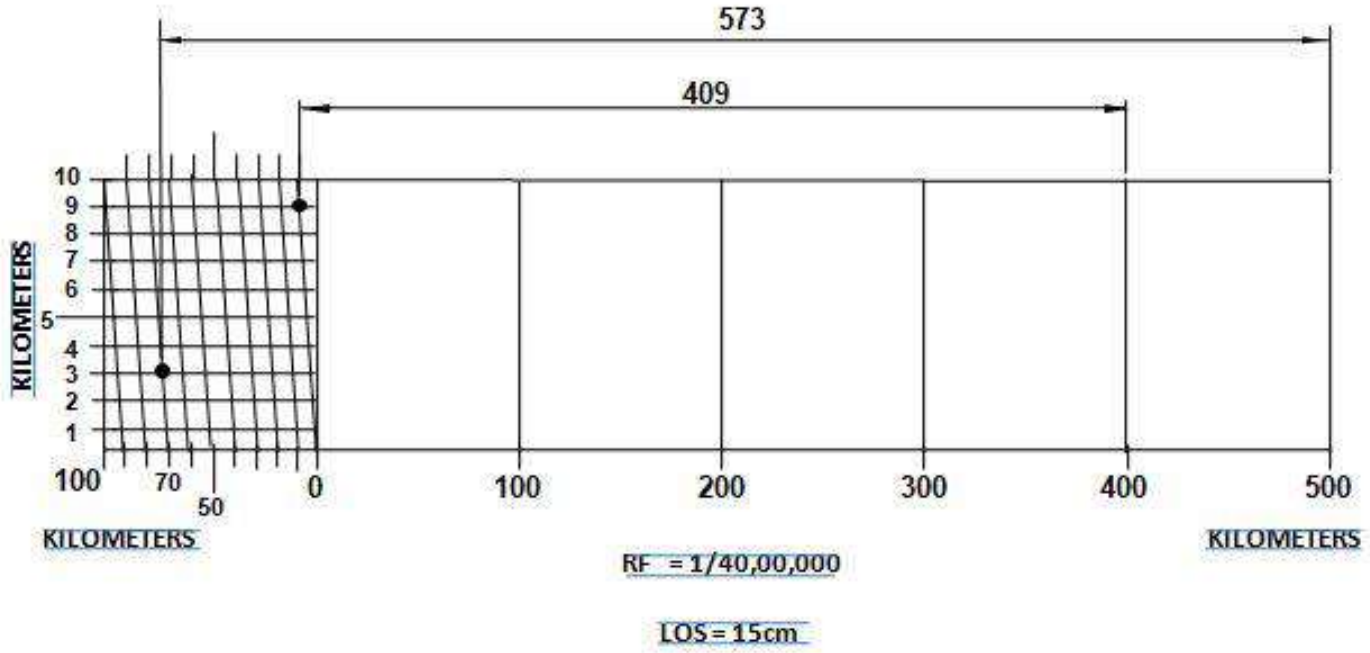


Problem 4

Q 6. The distance between two stations is 100 Km and it is represented on a map by a line of 2.5 cm. Draw a diagonal scale showing single Km. Mark off 409 Km & 573 Km on the scale.

1. RF = 2.5 cm/100 km = 2.5/(100x 100000)
   = 1/4000000
2. L.O.S = (1/4000000) X 600 km
   = (1/4000000) X 600 X 100000 cm = 15 cm

Note:
Maximum length of scale is not given.
But the maximum distance to show is 573 Km.
So take maximum length of scale as 600 Km.



Thanks

ENGINEERING GRAPHICS

UNIT- 2

Topic:
Projection of Points

ORTHOGRAPHIC PROJECTIONS:

IT IS A TECHNICAL DRAWING IN WHICH DIFFERENT VIEWS OF AN OBJECT ARE PROJECTED ON DIFFERENT REFERENCE PLANES OBSERVING PERPENDICULAR TO RESPECTIVE REFERENCE PLANE

Different Reference planes are

Horizontal Plane (HP),
Vertical Frontal Plane (VP)
Side Or Profile Plane (PP)

And

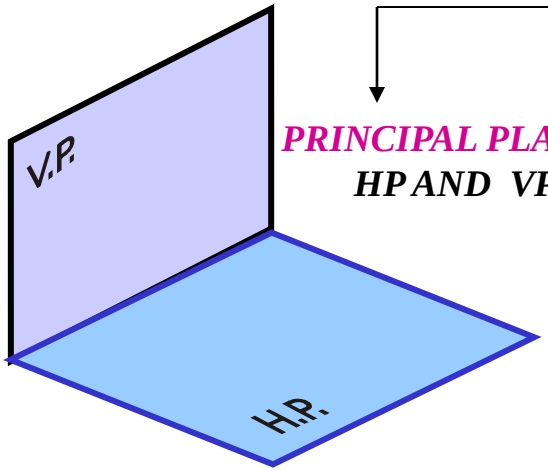
Different Views are Front View (FV), Top View (TV) and Side View (SV)

FV is a view projected on VP
TV is a view projected on HP
SV is a view projected on PP

IMPORTANT TERMS OF ORTHOGRAPHIC PROJECTIONS:

1. Planes.
2. Pattern of planes & Pattern of views
3. Methods of drawing Orthographic Projections

PLANES

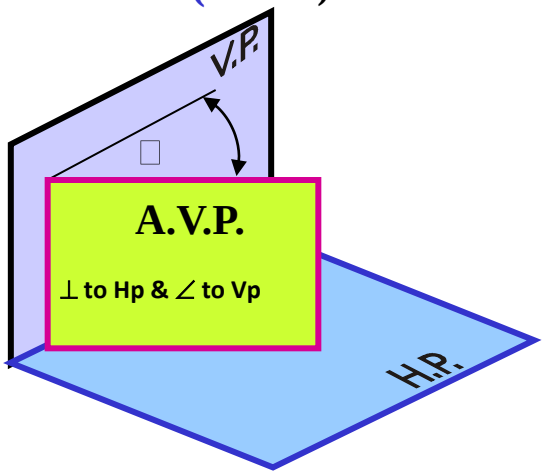


PRINCIPAL PLANES

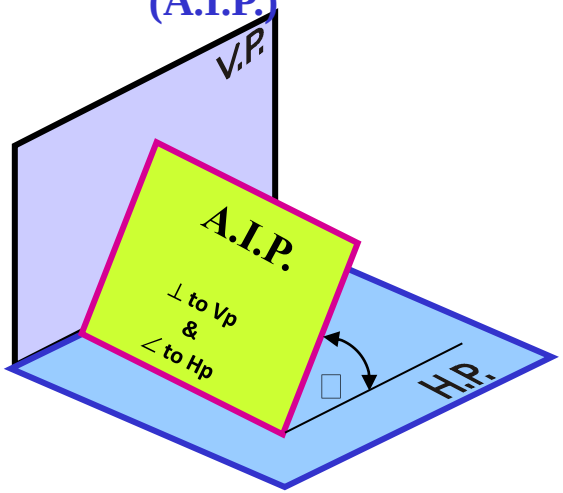
HP AND VP

AUXILIARY PLANES

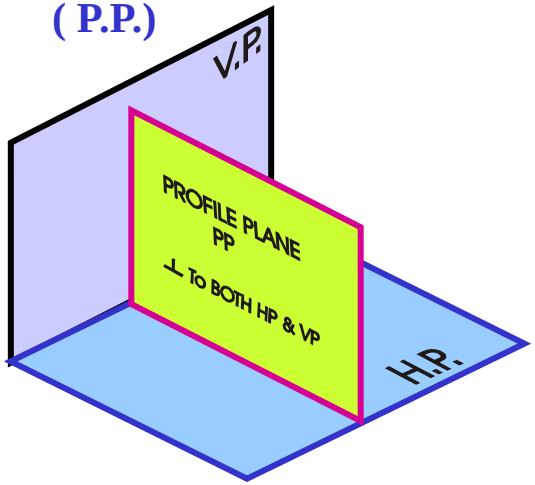
Auxiliary Vertical Plane (A.V.P.)



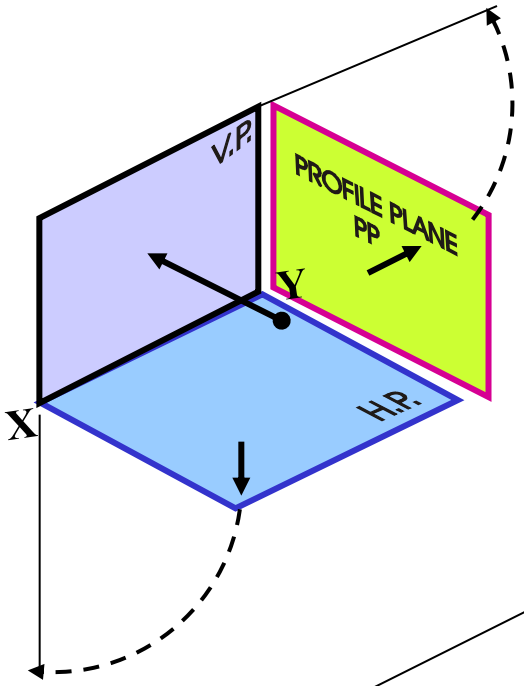
Auxiliary Inclined Plane (A.I.P.)



Profile Plane (P.P.)



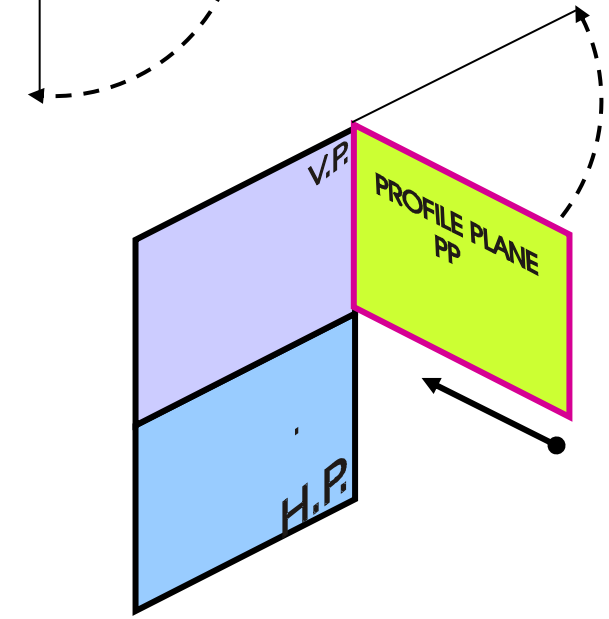
PATTERN OF PLANES & VIEWS (First Angle Method)



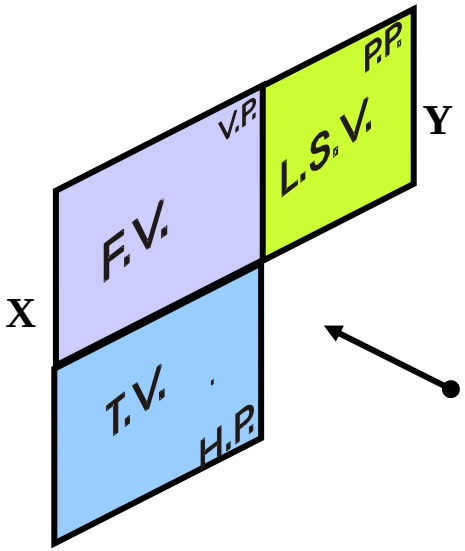
THIS IS A PICTORIAL SET-UP OF ALL THREE PLANES.
ARROW DIRECTION IS A NORMAL WAY OF OBSERVING THE OBJECT.
BUT IN THIS DIRECTION ONLY VP AND A VIEW ON IT (FV) CAN BE SEEN.
THE OTHER PLANES AND VIEWS ON THOSE CAN NOT BE SEEN.

PROCEDURE TO SOLVE ABOVE PROBLEM:-

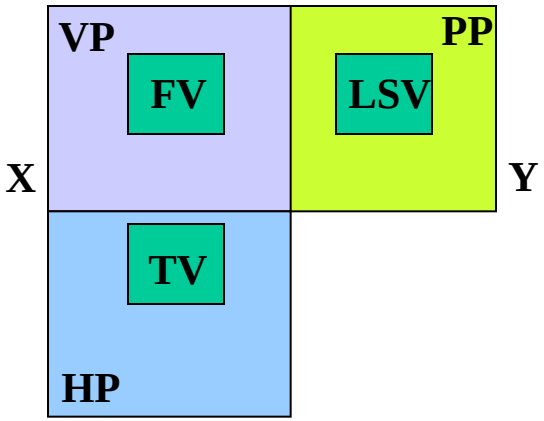
TO MAKE THOSE PLANES ALSO VISIBLE FROM THE ARROW DIRECTION,
A) HP IS ROTATED 90^0 DOUNWARD
B) PP, 90^0 IN RIGHT SIDE DIRECTION.
THIS WAY BOTH PLANES ARE BROUGHT IN THE SAME PLANE CONTAINING VP.



HP IS ROTATED DOWNWARD 90^0
AND
BROUGHT IN THE PLANE OF VP.



PP IS ROTATED IN RIGHT SIDE 90^0
AND
BROUGHT IN THE PLANE OF VP.



ACTUAL PATTERN OF PLANES & VIEWS
OF ORTHOGRAPHIC PROJECTIONS
DRAWN IN
FIRST ANGLE METHOD OF PROJECTIONS

Projection of Points

- **A "Point" may be situated, in space, in any one of the "four quadrants" formed by the "two reference/ principal planes" or a point may lie in any one or both of them,**

- **The projections of a "Point" are obtained by extending projectors perpendicular to the reference/ principal planes,**

- **One of the reference/ principal planes is then rotated so that the first and third quadrants are opened out,**

- **The projections of point are shown on a flat surface in their respective positions either above or below or in xy line.**

Projection of Points

The position of a **point** in engineering drawing is defined with respect to its distance from the three principle planes i.e., with respect to the VP, HP, & PP.

VP: The plane in front of observer is the vertical plane. (VP) or it is also called a Frontal plane.

HP: The plane which is Horizontal and perpendicular to VP is Horizontal Plane.

Note: The planes HP and VP are called Principal Planes.

Reference Line: The line of intersection of HP and VP is called reference line, which is denoted by X-Y

PROJECTIONS OF POINTS

TO DRAW PROJECTIONS OF ANY OBJECT (Eg. POINT), ONE MUST HAVE FOLLOWING INFORMATION

A) **OBJECT** (POINT)

{ WITH IT'S DESCRIPTION, WELL DEFINED}

B) **OBSERVER**

{ ALWAYS OBSERVING PERPENDICULAR TO RESP. REF. PLANE}

C) **LOCATION OF OBJECT**

{ MEANS IT'S POSITION WITH REFFERENCE TO H.P. & V.P.}

TERMS 'ABOVE' & 'BELOW' WITH RESPECTIVE TO H.P.
AND TERMS 'INFRONT' & 'BEHIND' WITH RESPECTIVE TO V.P
FORM 4 QUADRANTS.
OBJECTS CAN BE PLACED IN ANY ONE OF THESE 4 QUADRANTS.

IT IS INTERESTING TO LEARN THE EFFECT ON THE POSITIONS OF VIEWS (FV, TV) OF THE OBJECT WITH RESP. TO X-Y LINE, WHEN PLACED IN DIFFERENT QUADRANTS.

TO MAKE IT EASY, HERE A POINT (A) IS TAKEN AS AN OBJECT. BECAUSE IT'S ALL VIEWS ARE JUST POINTS.

Types of Views

Front View (FV): The projection on the VP is called the Front View (FV) or Vertical Projection or front elevation

Top View (TV): The projection on the HP is called the Top View (TV) or Horizontal Projection or Plan. or Elevation.

Side View: The projection on the side from the object is called the side views.

Side views is classified in to

1. Left side view and (LSV)
2. Right side view(RSV)

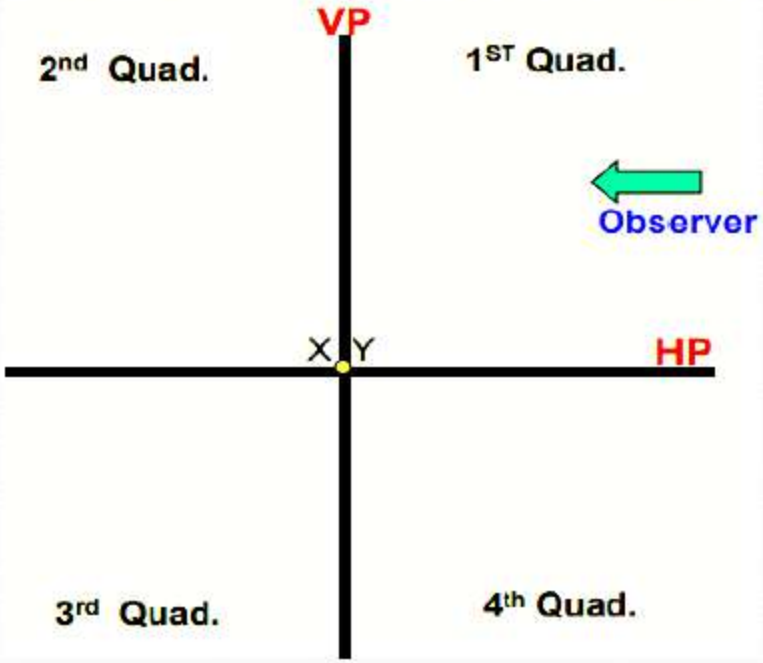
Positions of Points

First quadrant -- Above HP & in front of VP

Second quadrant -- Above HP & behind VP

Third quadrant -- Below HP & behind VP

Fourth quadrant -- Below HP & in front of VP

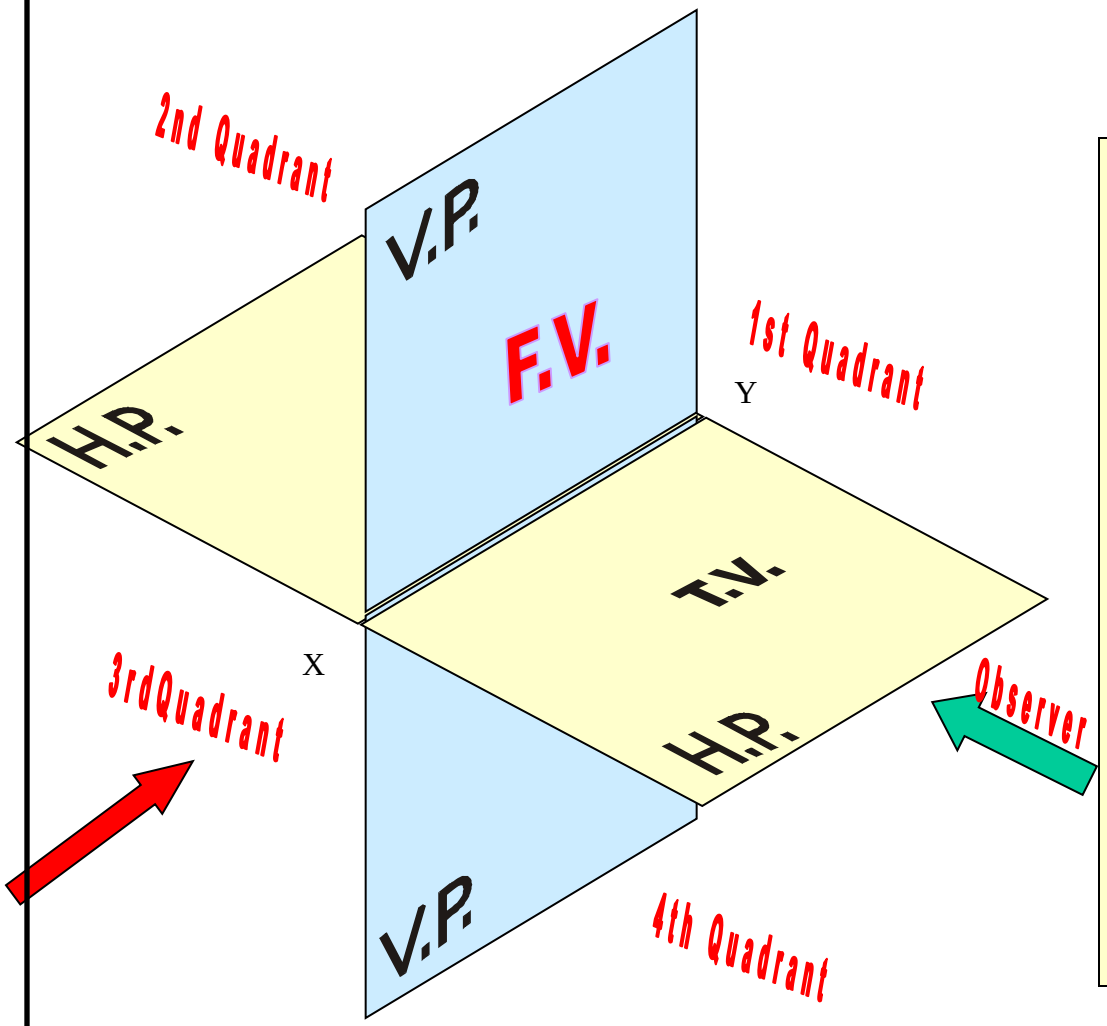


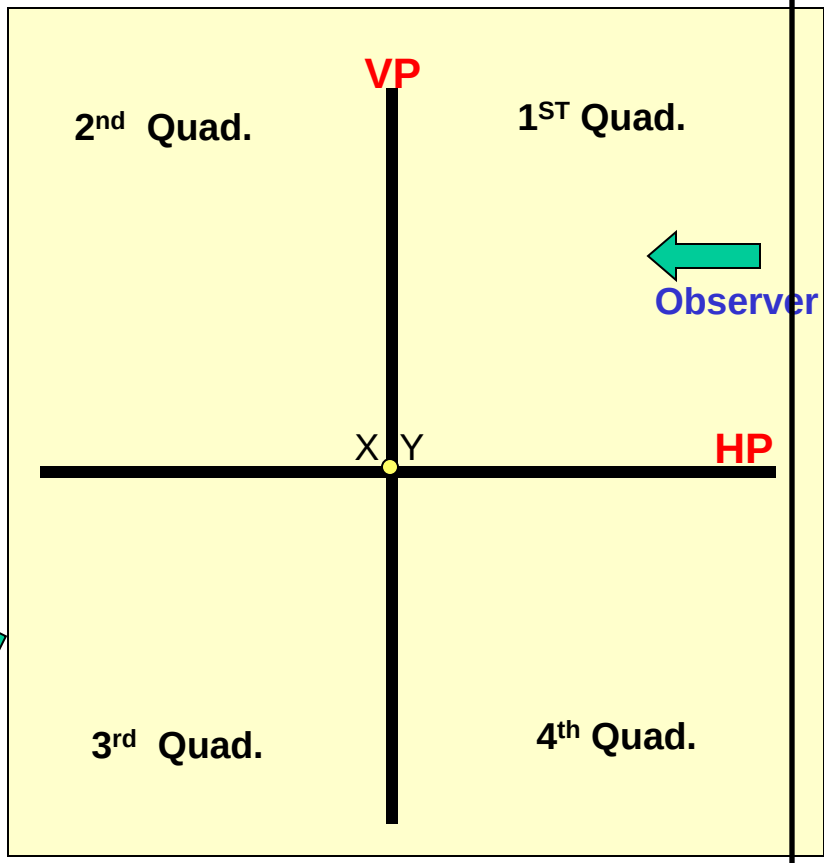
NOTATIONS

FOLLOWING NOTATIONS SHOULD BE FOLLOWED WHILE NAMEING DIFFERENT VIEWS IN ORTHOGRAPHIC PROJECTIONS.

OBJECT	POINT A	LINE AB
IT'S TOP VIEW	a	a b
IT'S FRONT VIEW	a'	a' b'
IT'S SIDE VIEW	a"	a" b"

SAME SYSTEM OF NOTATIONS SHOULD BE FOLLOWED INCASE NUMBERS, LIKE 1, 2, 3 – ARE USED.



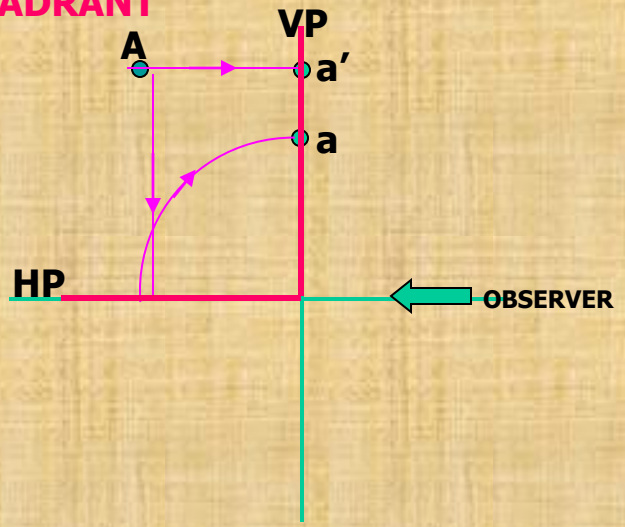


THIS QUADRANT PATTERN,
IF OBSERVED ALONG X-Y LINE (IN RED ARROW DIRECTION)
WILL EXACTLY APPEAR AS SHOWN ON RIGHT SIDE AND HENCE,
IT IS FURTHER USED TO UNDERSTAND ILLUSTRATION PROPERLLY.

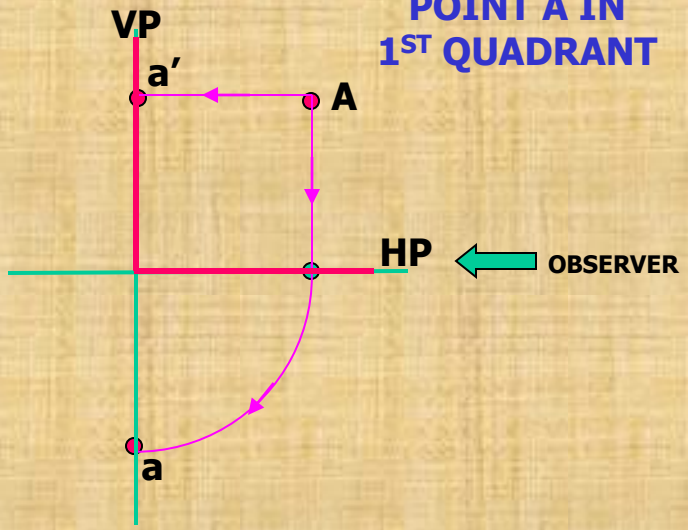
Point A is Placed In different quadrants and it's Fv & Tv are brought in same plane for Observer to see clearly.
Fv is visible as it is a view on VP. But as Tv is
is a view on Hp,
it is rotated downward 90^0, In clockwise direction.The In front part of Hp comes below xy line and the part behind Vp comes above.

Observe and note the process.

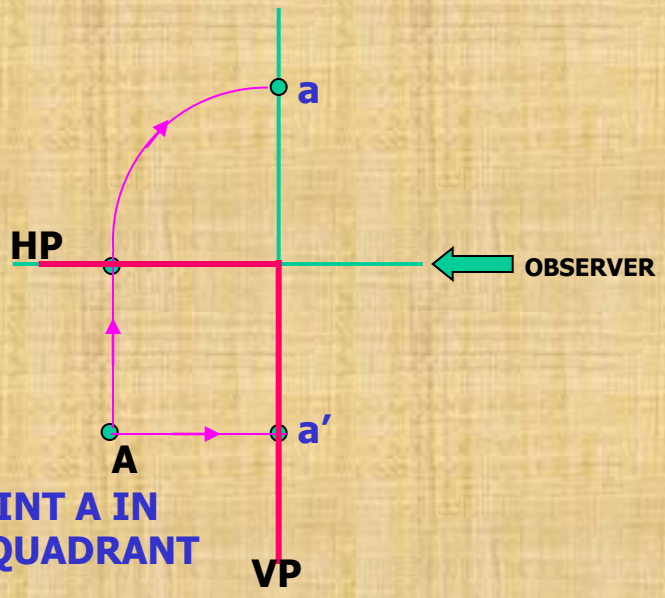
POINT A IN 2ND QUADRANT



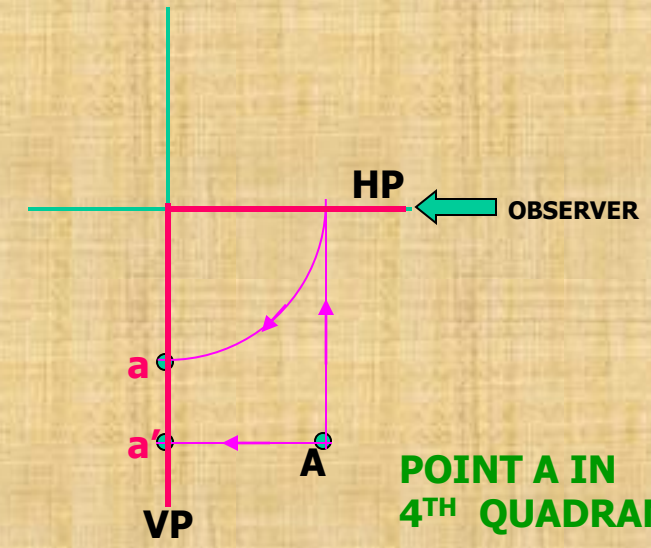
POINT A IN 1ST QUADRANT



POINT A IN 3RD QUADRANT

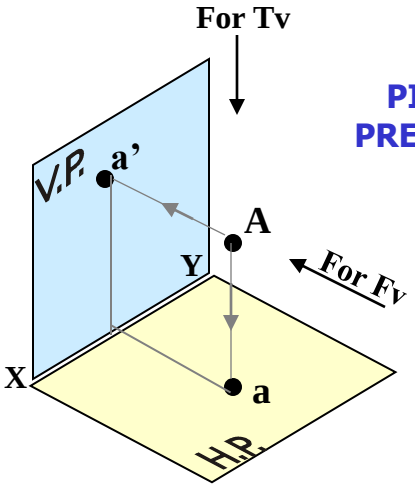


POINT A IN 4TH QUADRANT



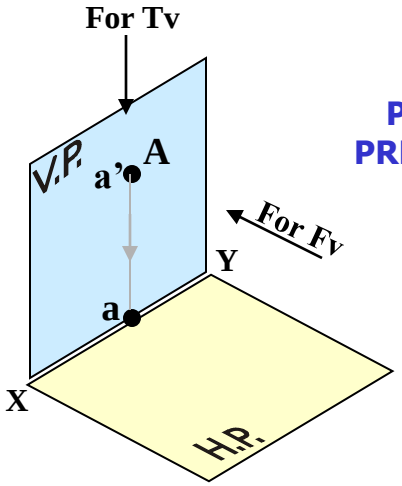
PROJECTIONS OF A POINT IN FIRST QUADRANT.

POINT A ABOVE HP & INFRONT OF VP



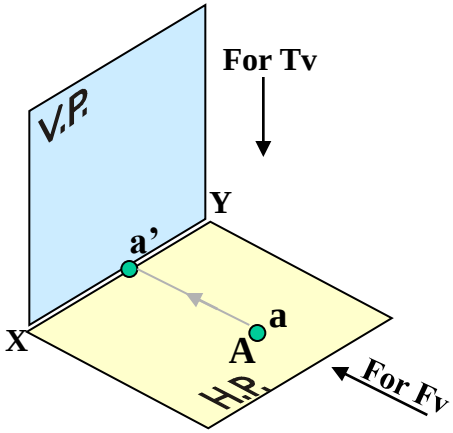
PICTORIAL PRESENTATION

POINT A ABOVE HP & IN VP



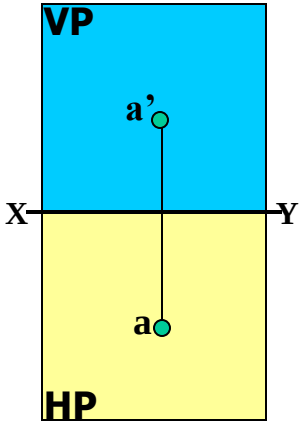
PICTORIAL PRESENTATION

POINT A IN HP & INFRONT OF VP

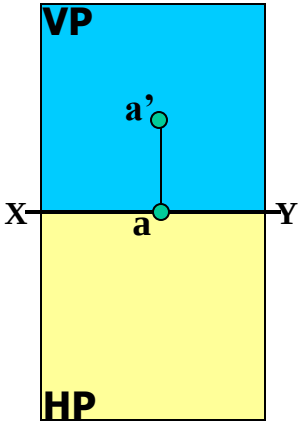


ORTHOGRAPHIC PRESENTATIONS OF ALL ABOVE CASES.

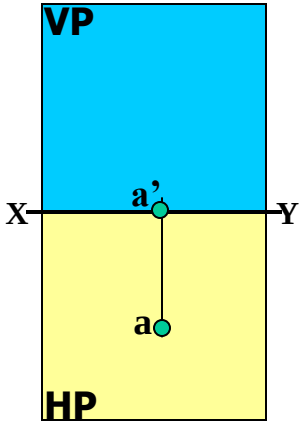
Fv above xy, Tv below xy.



Fv above xy, Tv on xy.

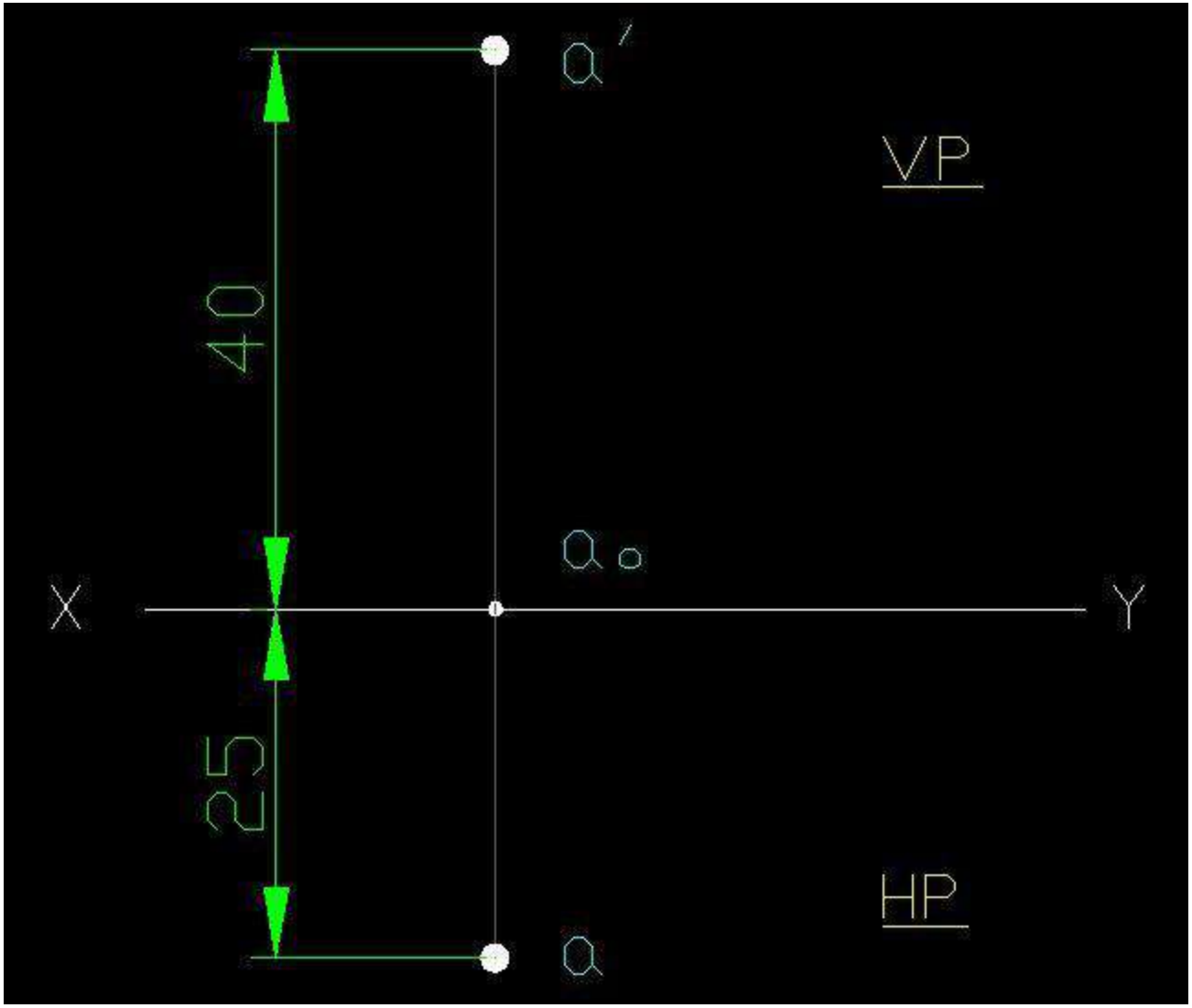


Fv on xy, Tv below xy.



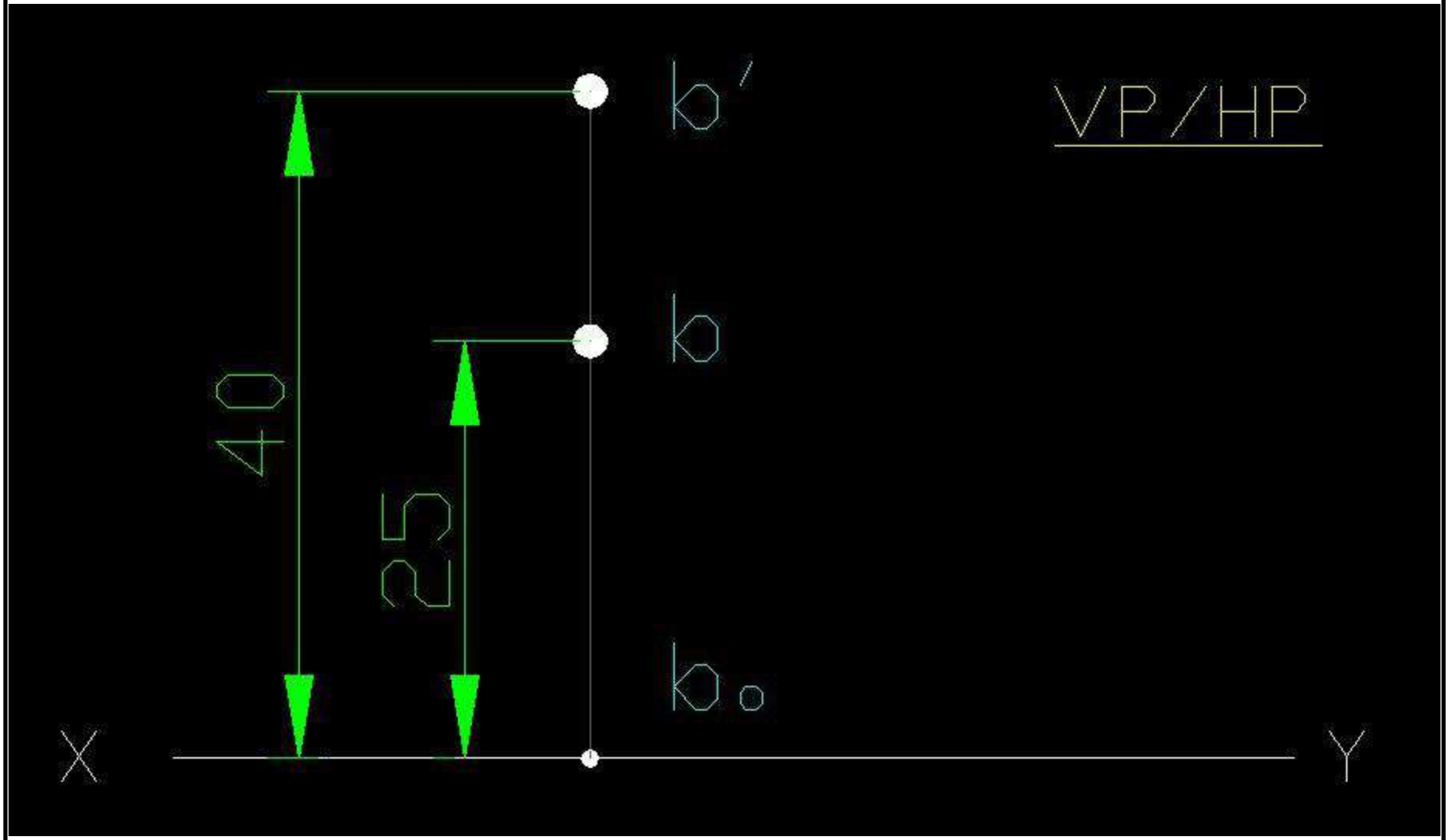
CASE 1: Point A is 40 mm above HP & 25 mm infront of VP. Draw Projections.

CASE 1: Point A is 40 mm above HP & 25 mm infront of VP. Draw Projections.



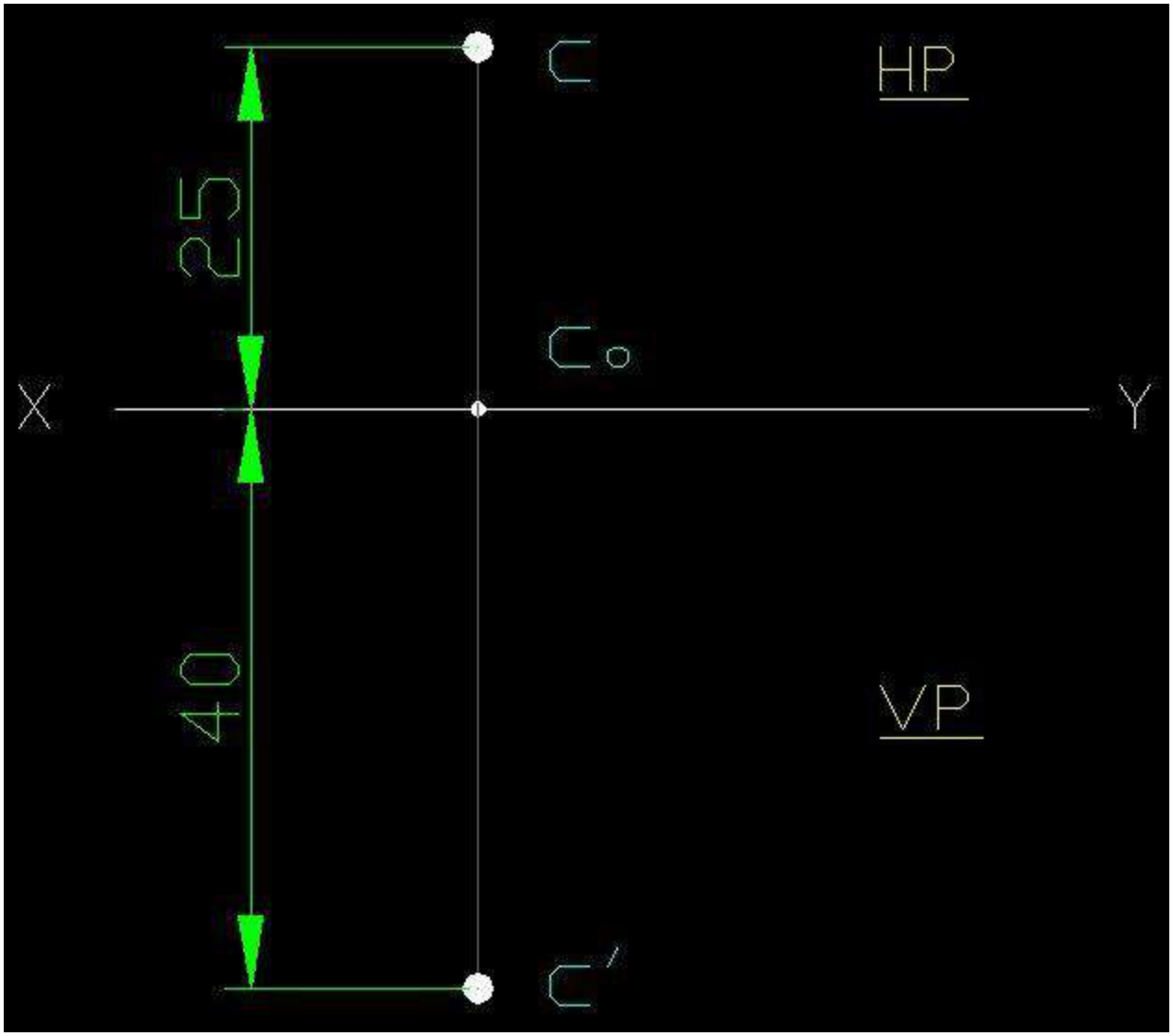
CASE 2: Point B is 40 mm above HP & 25 mm behind VP. Draw Projections.

CASE 2: Point B is 40 mm above HP & 25 mm behind VP. Draw Projections.



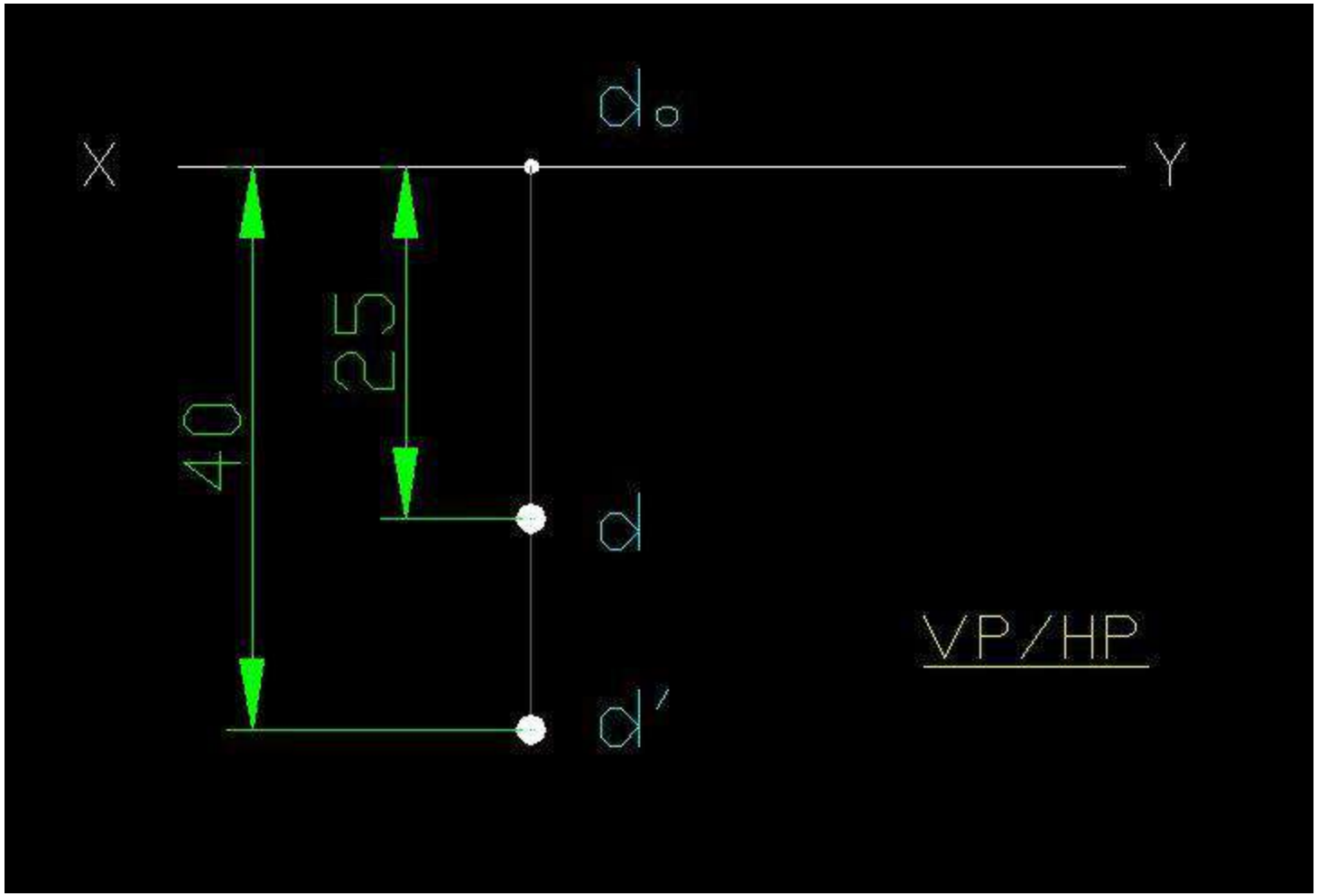
CASE 3: Point C is 40 mm below HP & 25 mm behind VP. Draw Projections.

CASE 3: Point C is 40 mm below HP & 25 mm behind VP. Draw Projections.



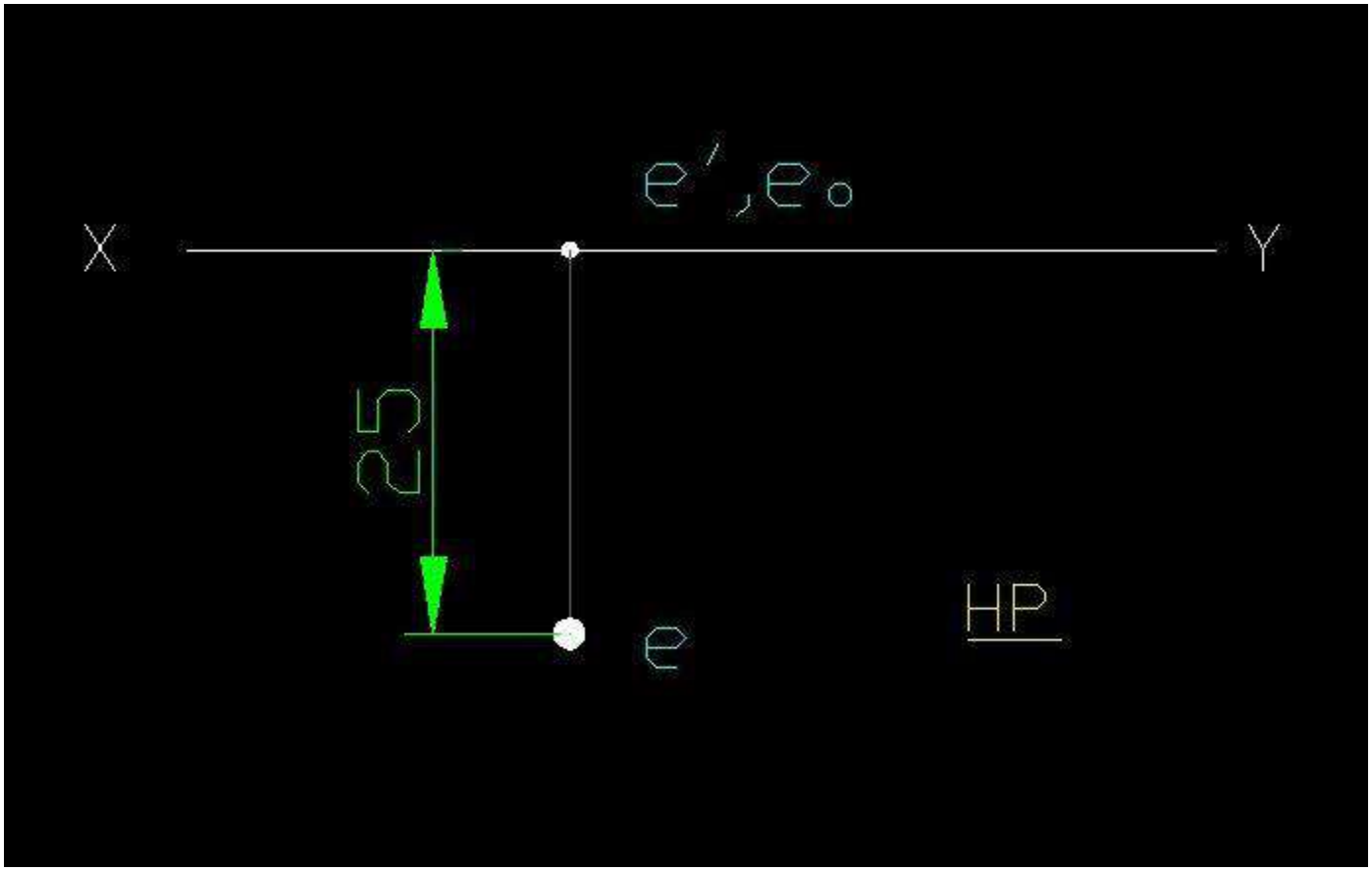
CASE 4: Point D is 40 mm below HP & 25 mm infront of VP. Draw Projections.

CASE 4: Point D is 40 mm below HP & 25 mm infront of VP. Draw Projections.



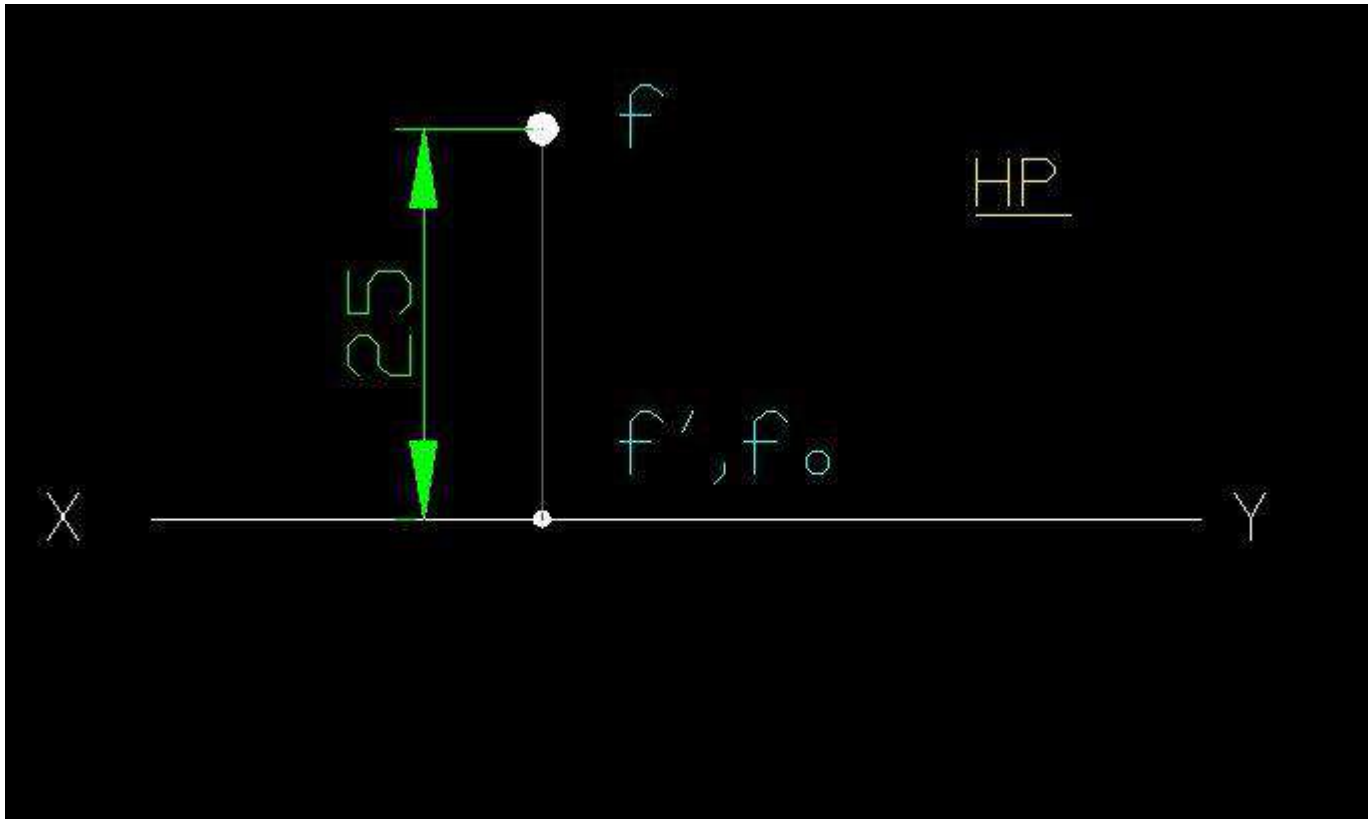
CASE 5: Point E is in HP & 25 mm infront of VP. Draw Projections.

CASE 5: Point E is in HP & 25 mm infront of VP. Draw Projections.



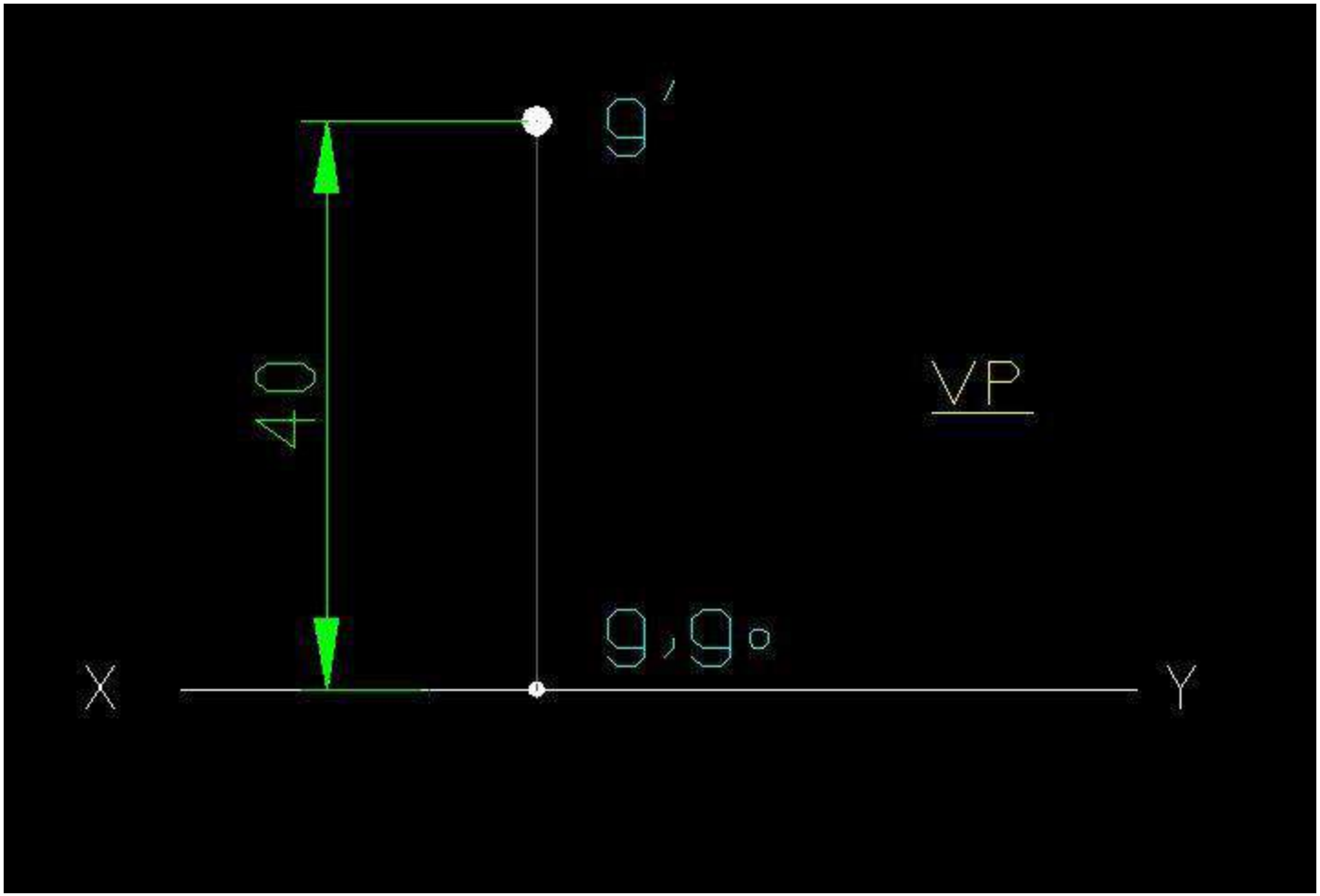
CASE 6: Point F is in HP & 25 mm behind VP. Draw Projections.

CASE 6: Point F is in HP & 25 mm behind VP. Draw Projections.



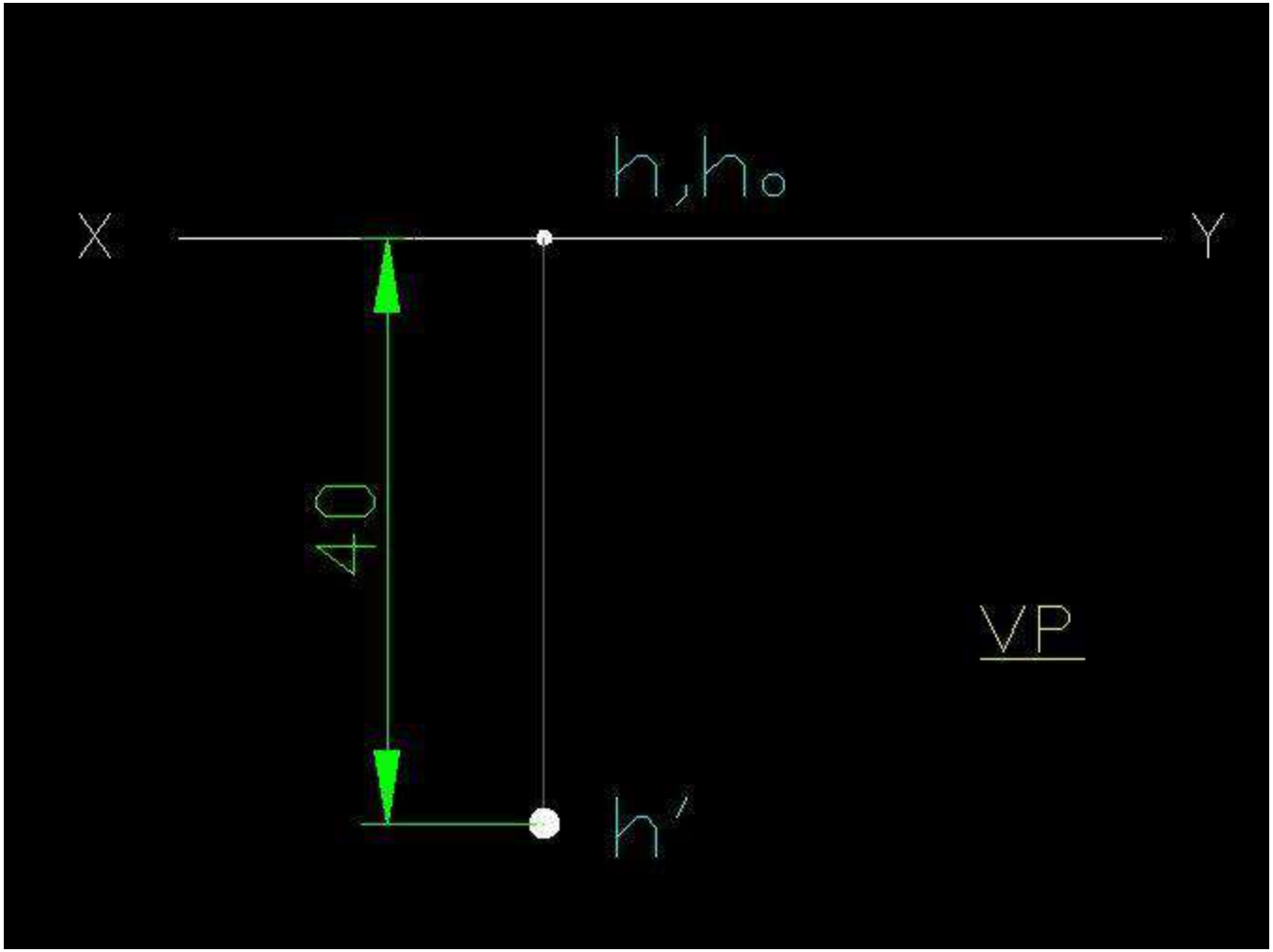
CASE 7: Point G is 40 mm above HP & in VP. Draw Projections.

CASE 7: Point G is 40 mm above HP & in VP. Draw Projections.



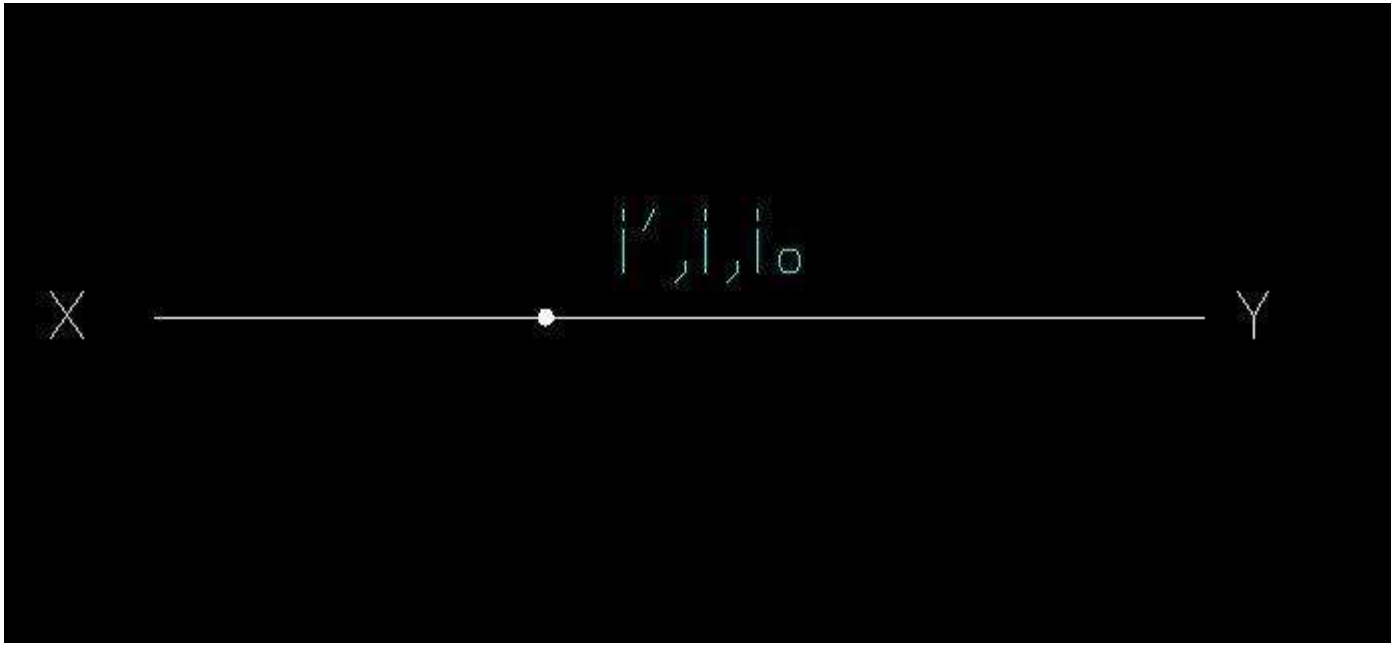
CASE 8: Point H is 40 mm below HP & in VP. Draw Projections.

CASE 8: Point H is 40 mm below HP & in VP. Draw Projections.



CASE 9: Point I is in HP & in VP. Draw Projections.

CASE 9: Point I is in HP & in VP. Draw Projections.



THANKS

ENGINEERING GRAPHICS

UNIT- 2

Topic:
Projection of Lines

PROJECTIONS OF STRAIGHT LINES.

INFORMATION REGARDING A LINE *means*
IT'S LENGTH,
POSITION OF IT'S ENDS WITH HP & VP
IT'S INCLINATIONS WITH HP & VP WILL BE GIVEN.
AIM:- TO DRAW IT'S PROJECTIONS - MEANS FV & TV.

SIMPLE CASES OF THE LINE

1. A VERTICAL LINE (LINE PERPENDICULAR TO HP & // TO VP)
2. A VERTICAL LINE (LINE PERPENDICULAR TO VP & // TO HP)
3. LINE PARALLEL TO BOTH HP & VP.
4. LINE INCLINED TO HP & PARALLEL TO VP.
5. LINE INCLINED TO VP & PARALLEL TO HP.

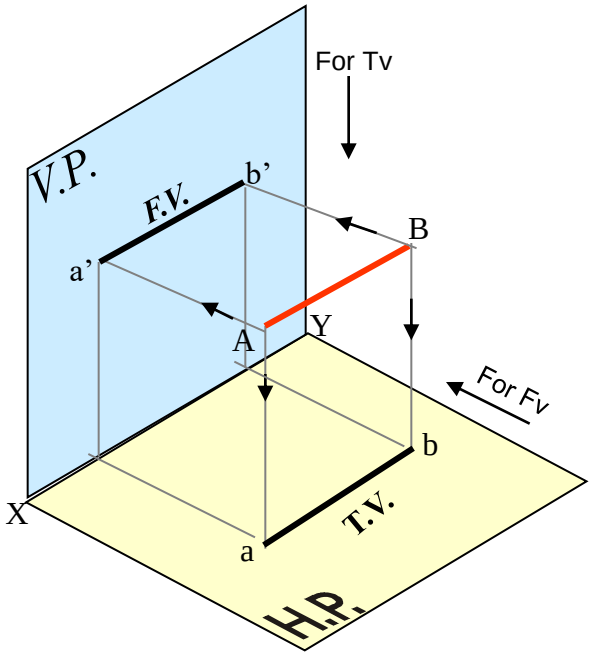
STUDY ILLUSTRATIONS GIVEN ON NEXT PAGE SHOWING CLEARLY THE NATURE OF FV & TV OF LINES LISTED ABOVE AND NOTE RESULTS.

1.

A Line // to HP & // to VP

Q: A line AB = 50 mm long. Endpoints A & B are 30 mm above HP & 20 mm in front of VP. Draw Projections.

(Pictorial Presentation)



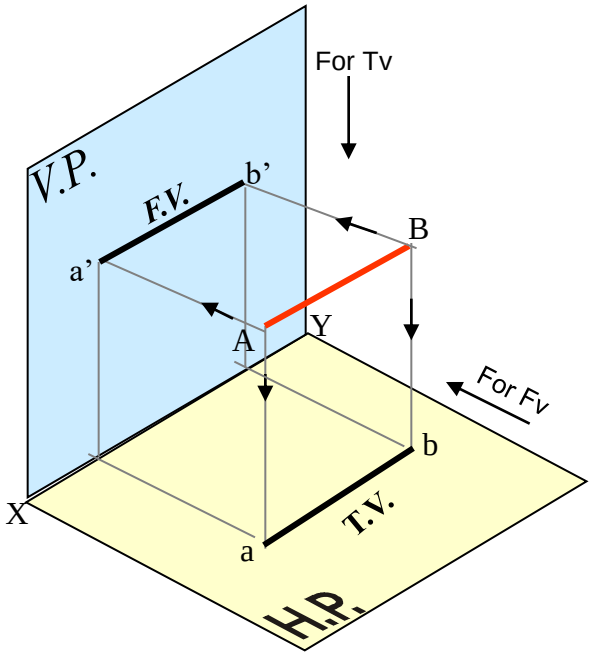
1.

A Line // to HP & // to VP

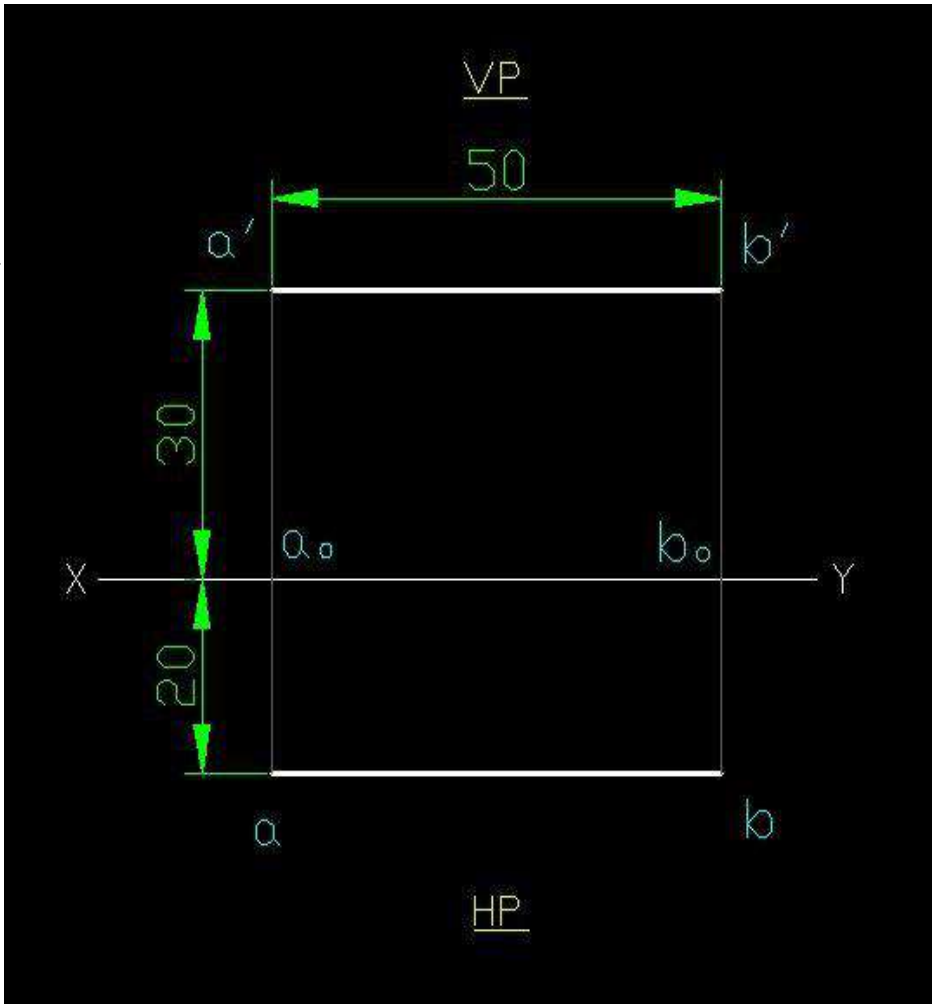
Q: A line AB = 50 mm long. Endpoints A & B are 30 mm above HP & 20 mm in front of VP. Draw Projections.

ANSWER

(Pictorial Presentation)



Note:
Fv & Tv both are
// to xy
&
both show T. L.

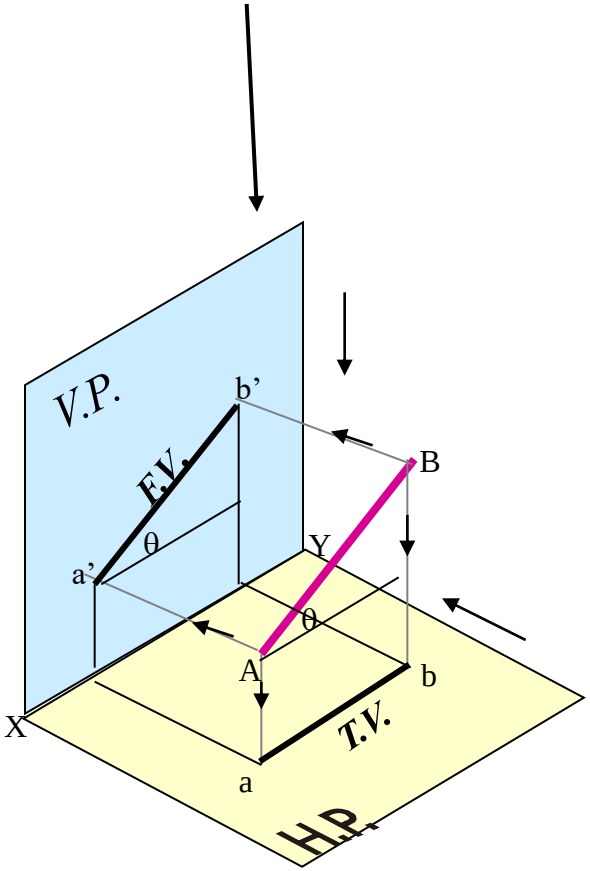


2.

A Line inclined to HP and parallel to VP

Q: A line AB = 50 mm long is inclined to HP at 30 degree. Endpoints A & B are 20 mm in front of VP. Endpoint A is 30 mm above HP. Draw projections. And also draw trace of the line.

(Pictorial Presentation)

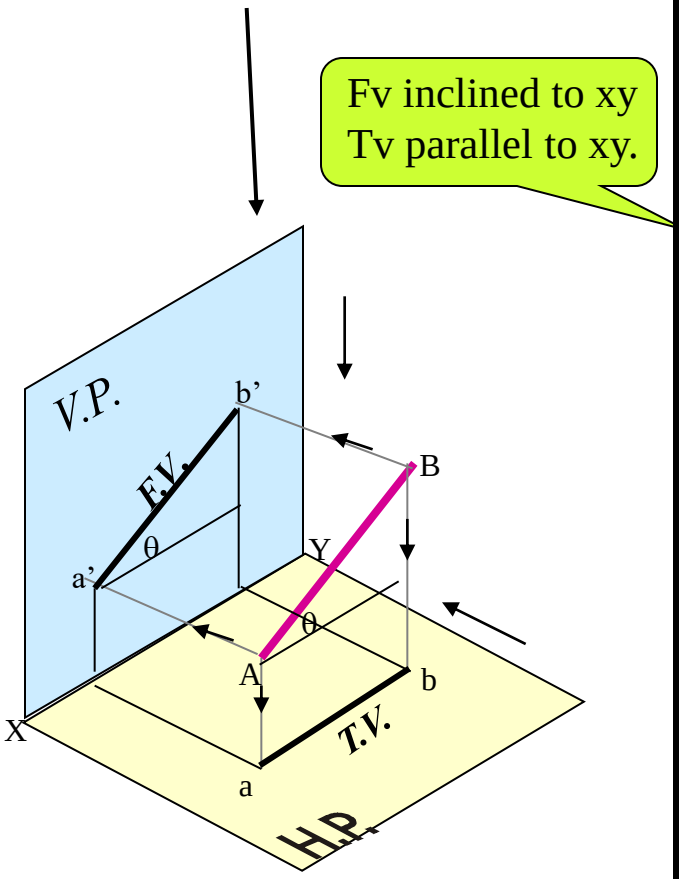


2.

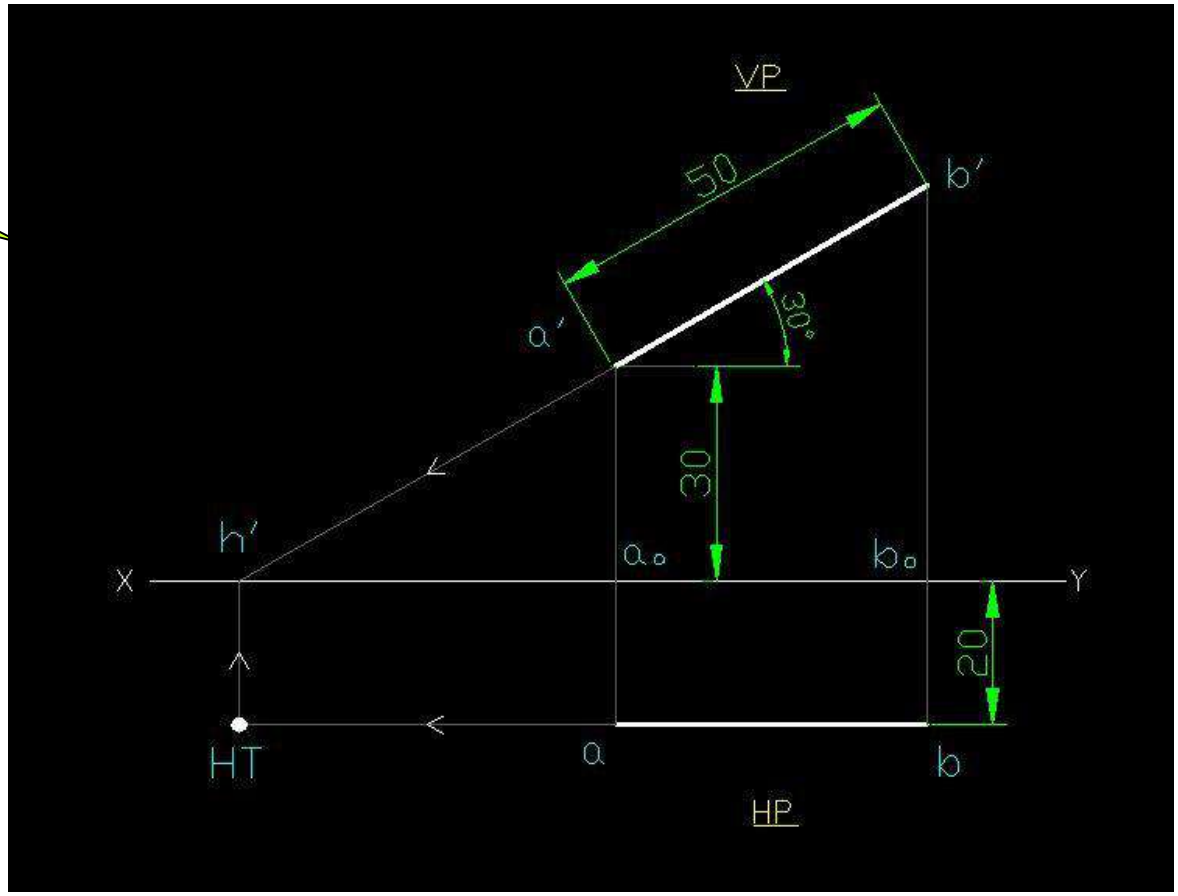
A Line inclined to HP and parallel to VP

Q: A line AB = 50 mm long is inclined to HP at 30 degree. Endpoints A & B are 20 mm in front of VP. Endpoint A is 30 mm above HP. Draw projections. And also draw trace of the line.

(Pictorial Presentation)



ANSWER

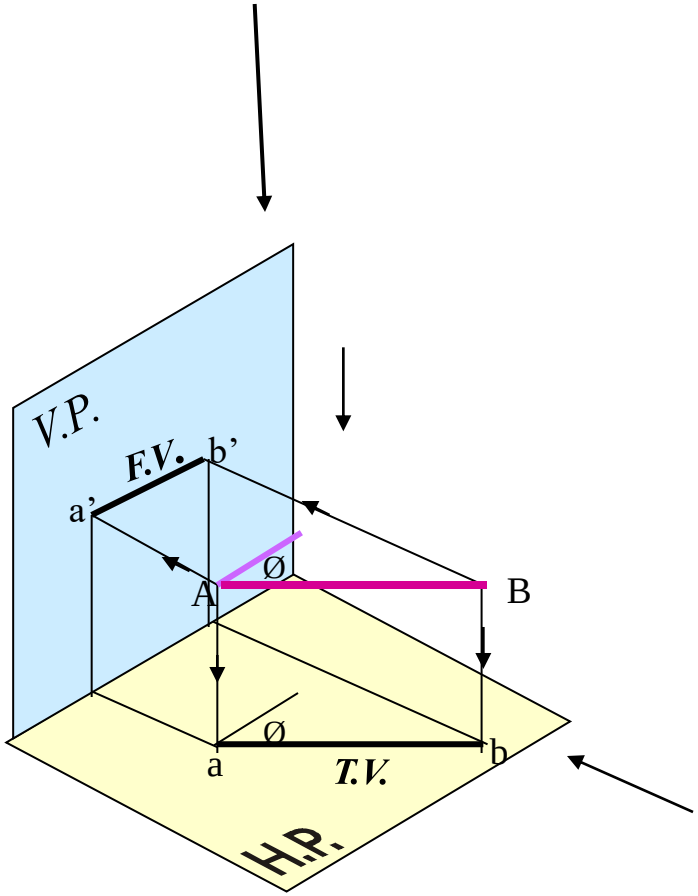


3.

A Line inclined to VP and parallel to HP

Q: A line AB = 50 mm long is inclined to VP at 45 degree. The endpoints A & B are 30 mm above HP. Endpoint A is 20 mm in front of VP. Draw projections. Also locate the trace of the line.

(Pictorial Presentation)

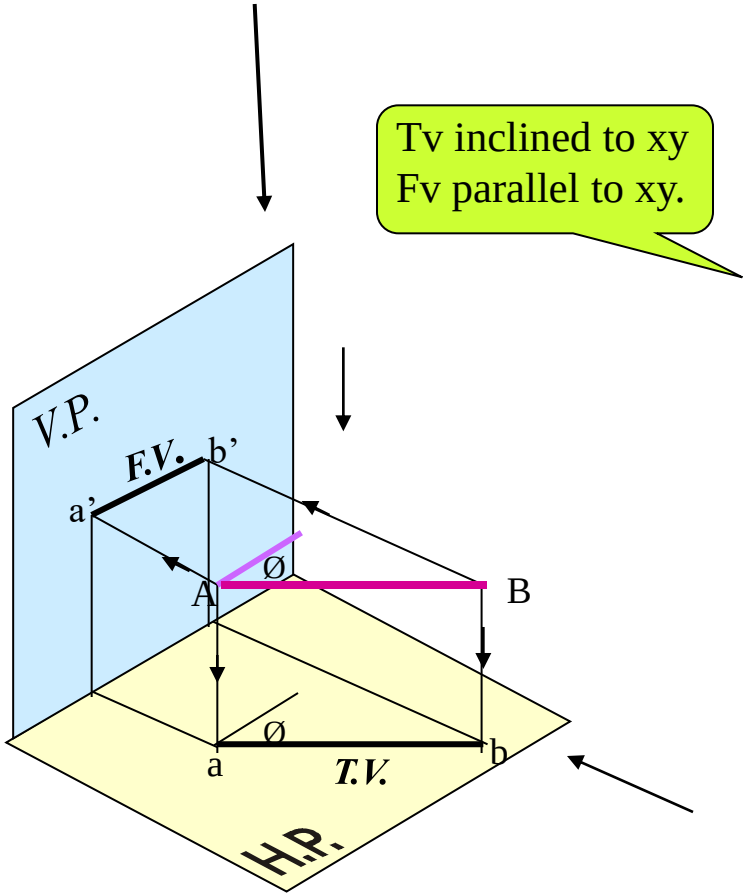


A Line inclined to VP and parallel to HP

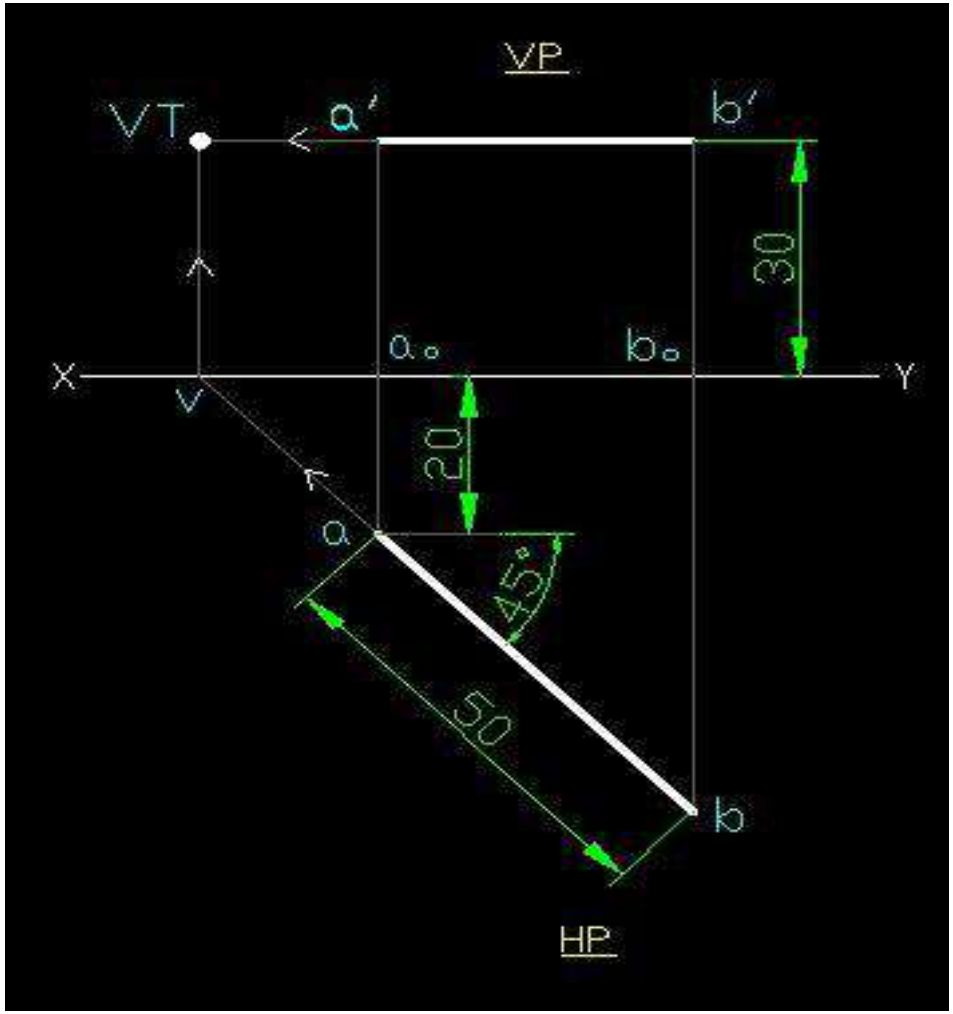
3.

Q: A line AB = 50 mm long is inclined to VP at 45 degree. The endpoints A & B are 30 mm above HP. Endpoint A is 20 mm in front of VP. Draw projections. Also locate the trace of the line.

(Pictorial Presentation)



ANSWER

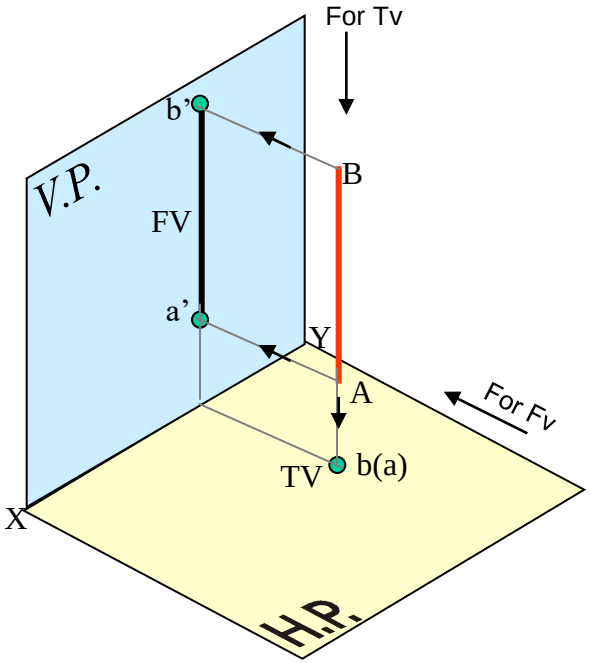


4.

A Line perpendicular to HP & // to VP

Q: A line AB = 50 mm long is perpendicular to HP. The end points A & B are 20 mm in front of VP. Endpoint A is 15 mm above HP. Draw Projections & also locate the trace of the line.

(Pictorial Presentation)

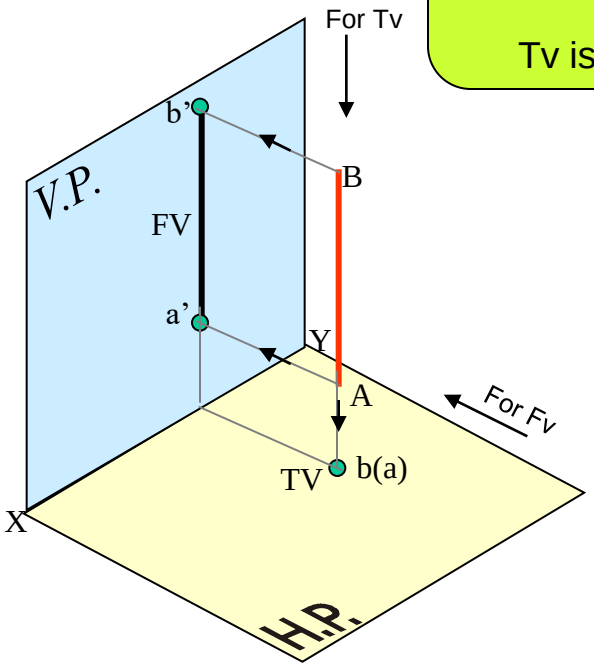


4.

A Line perpendicular to HP & // to VP

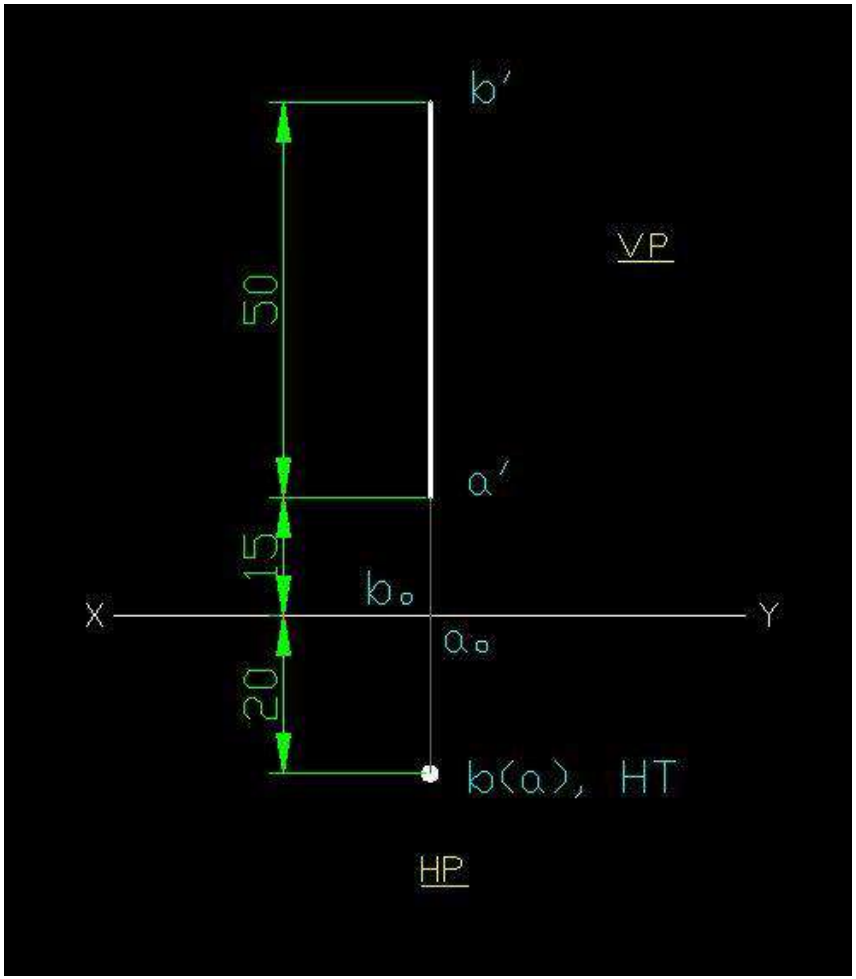
Q: A line AB = 50 mm long is perpendicular to HP. The end points A & B are 20 mm in front of VP. Endpoint A is 15 mm above HP. Draw Projections & also locate the trace of the line.

(Pictorial Presentation)



Note:
Fv is a vertical line
Showing True Length
&
Tv is a point.

ANSWER



5.

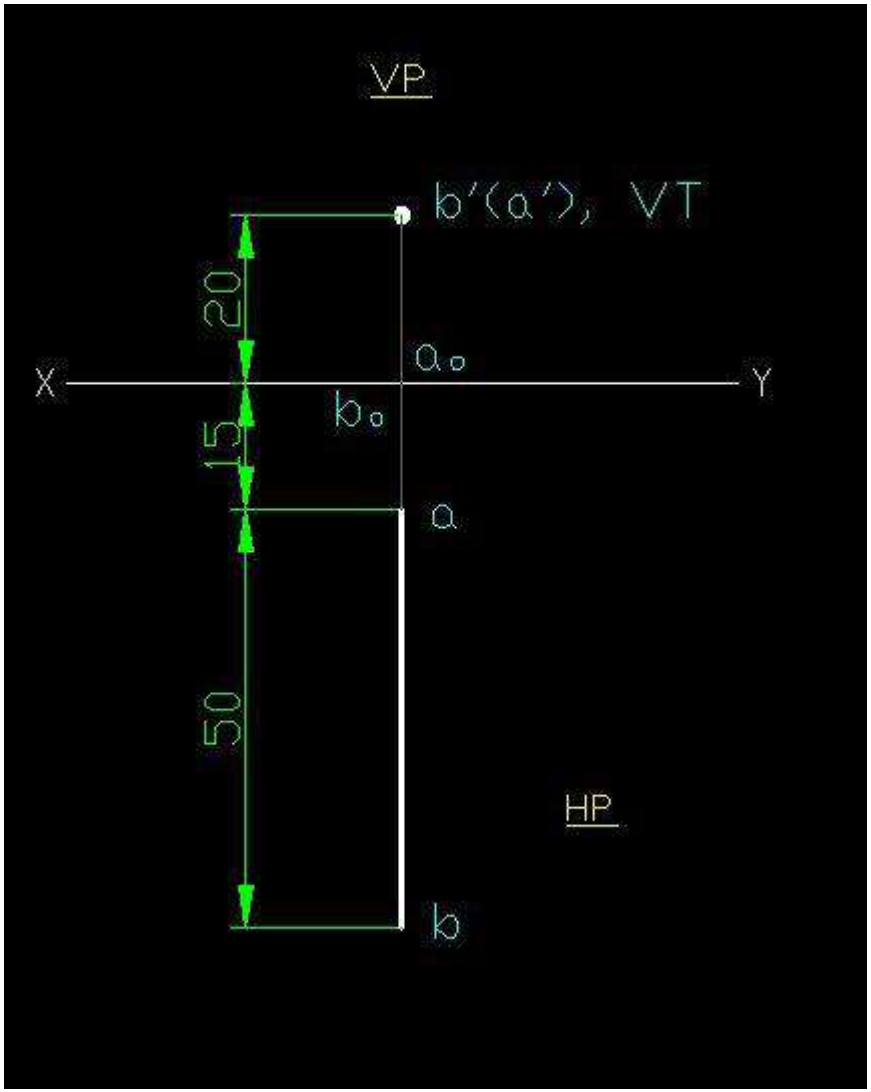
A Line perpendicular to VP & // to HP

Q: A line AB = 50 mm long is perpendicular to VP. The end points A & B are 20 mm above HP. Endpoint A is 15 mm in front of VP. Draw Projections & also locate the trace of the line.

5.

A Line perpendicular to VP & // to HP

Q: A line AB = 50 mm long is perpendicular to VP. The end points A & B are 20 mm above HP. Endpoint A is 15 mm in front of VP. Draw Projections & also locate the trace of the line.



6.

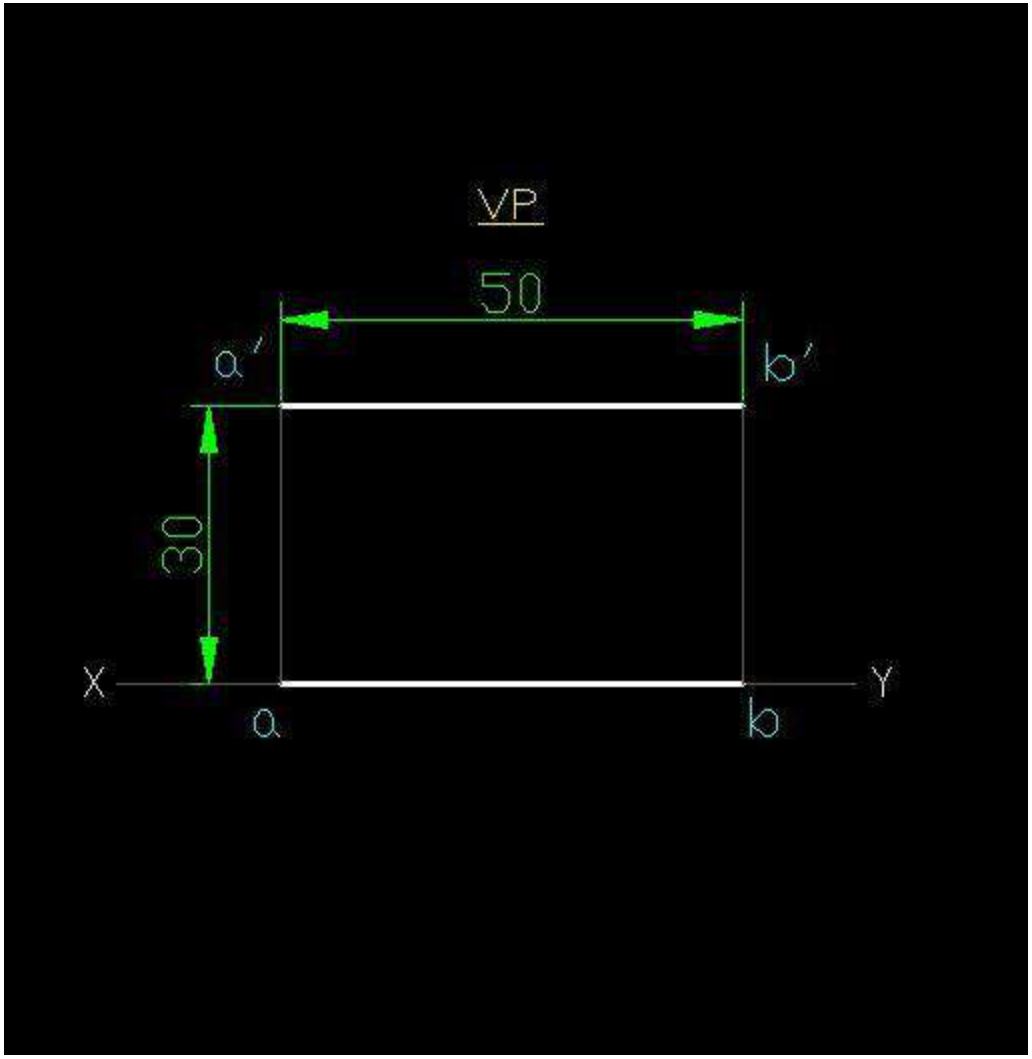
A Line in VP

Q: A line AB = 50 mm long is in VP. The end points A & B are 30 mm above HP. Draw Projections.

6.

A Line in VP

Q: A line AB = 50 mm long is in VP. The end points A & B are 30 mm above HP. Draw Projections.



7.

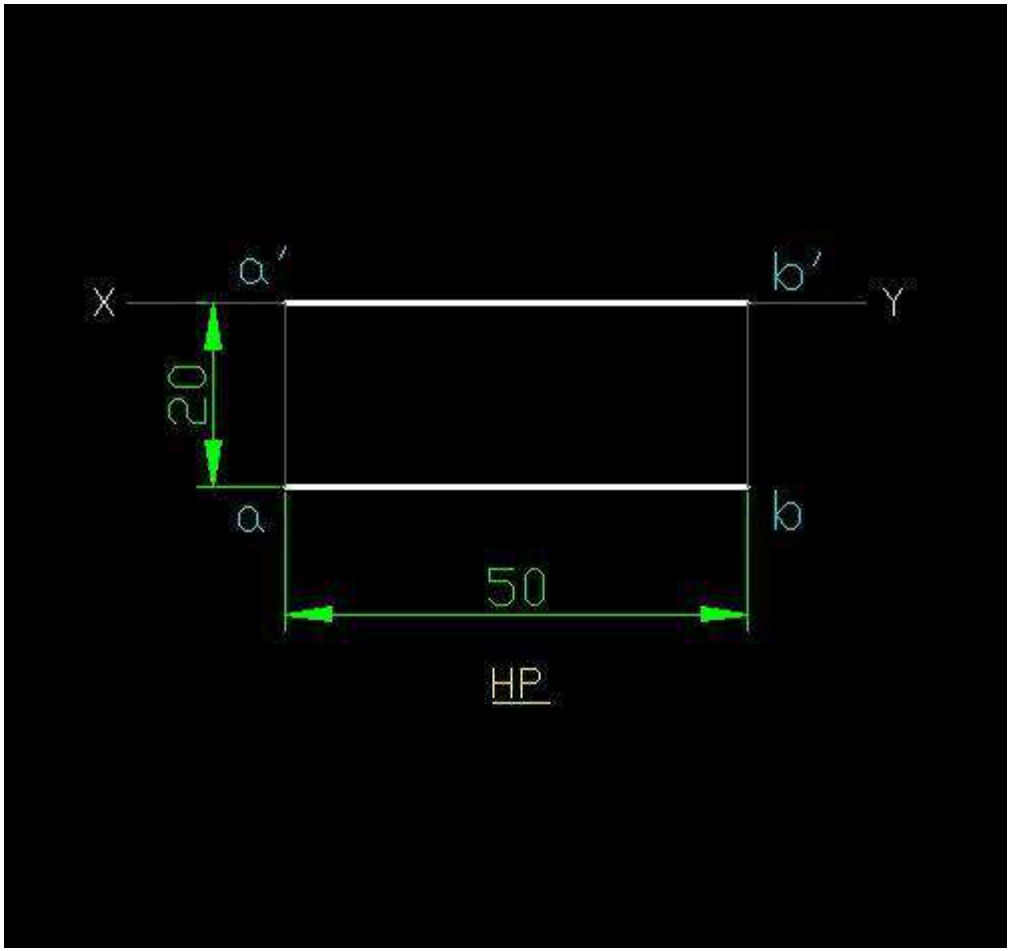
A Line in HP

Q: A line AB = 50 mm long is in HP. The end points A & B are 20 mm in front of VP. Draw Projections.

7.

A Line in HP

Q: A line AB = 50 mm long is in HP. The end points A & B are 20 mm in front of VP. Draw Projections.

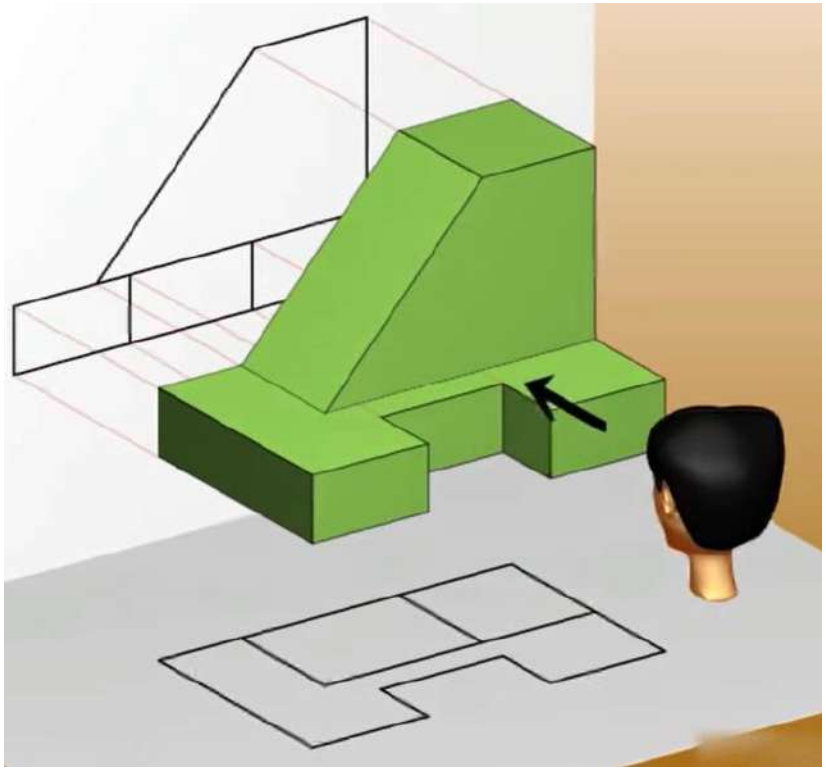


THANKS

Unit-3

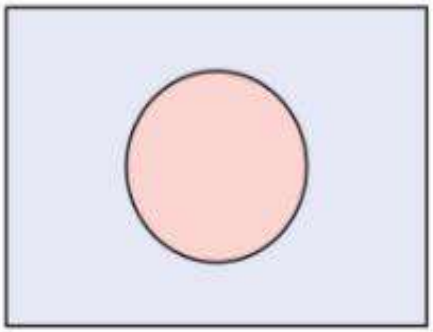
ORTHOGRAPHIC PROJECTION

"When the projectors are parallel to each other and also perpendicular to the plane, the projection is called orthographic projection"

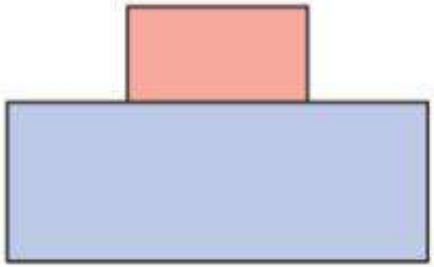


Objective

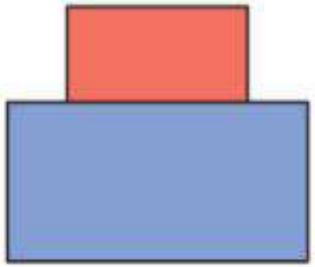
An orthographic drawing represents a three-dimensional object using several two-dimensional views of the object. Three-dimensional drawings can be used to show the overall concept and design, but they are often not able to explain actual shape, size and other details of object which are required for the purpose of manufacturing . Orthographic drawings can help to overcome those challenges.



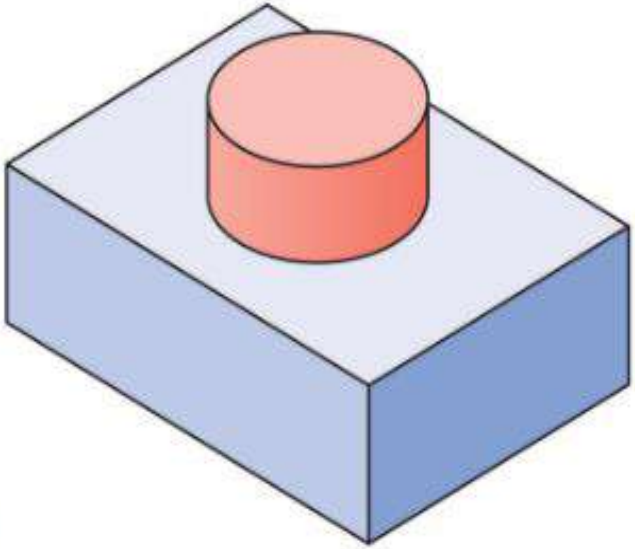
top view



front view



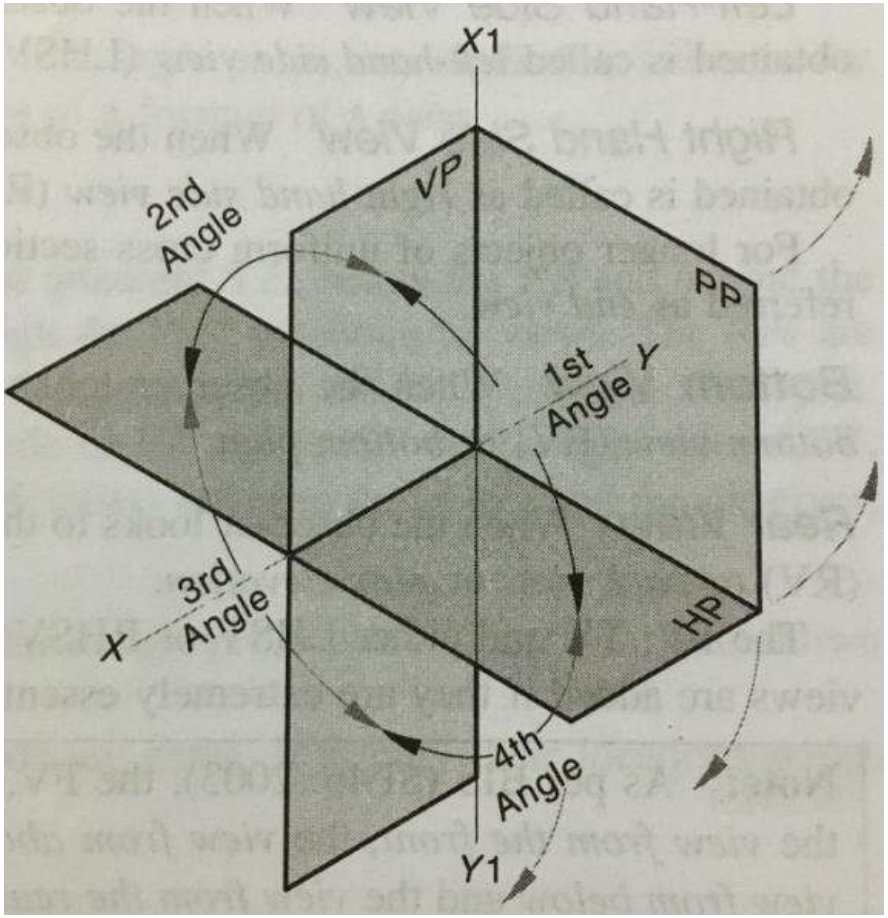
side view



3-dimensional isometric projection

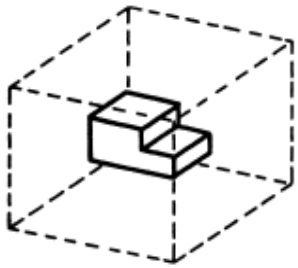
Three Reference Planes:-

VP- Vertical Plane
HP- Horizontal Plane
PP- Profile Plane

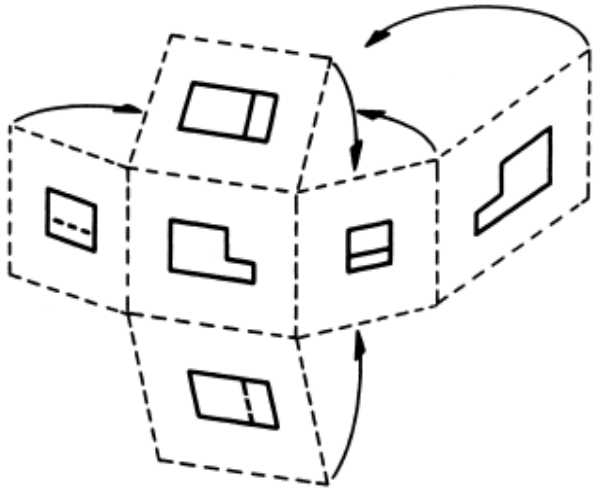


Orthographic Views

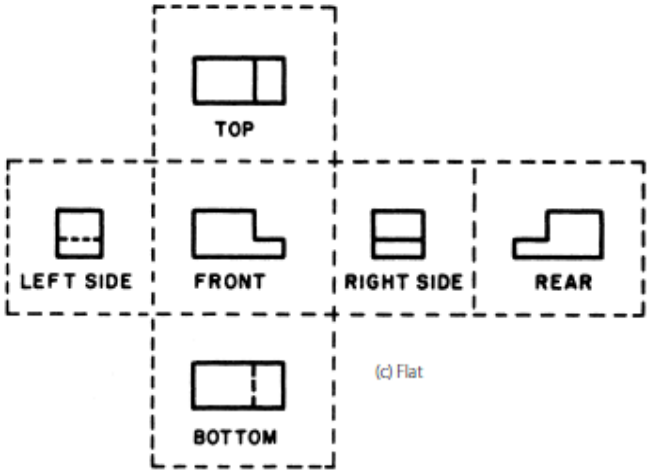
Front View- FV
Top View- TV
Left Hand Side View-LHSV
Right Hand Side View- RHSV
Bottom View- BV
Rear View- RV



(a) Object



(b) Rotated

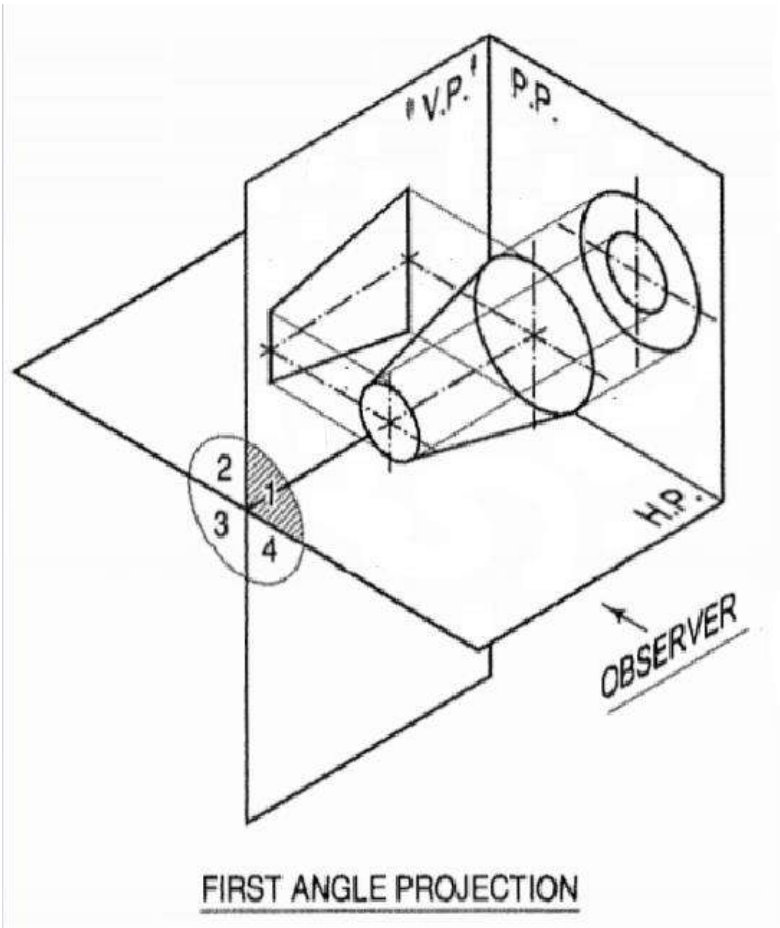


(c) Flat

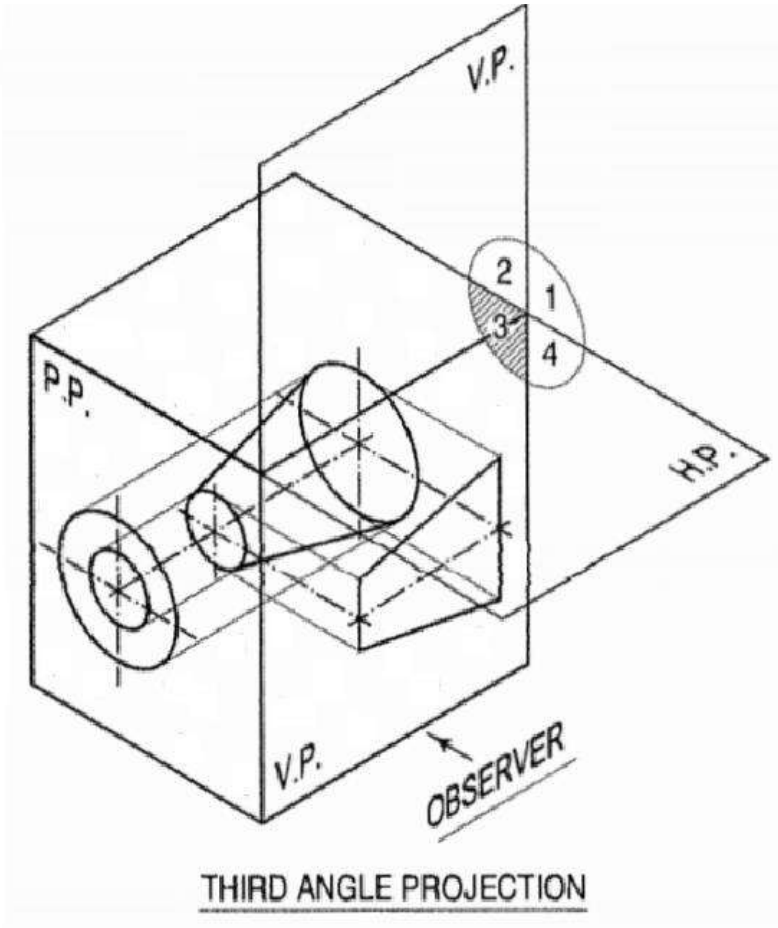
Note:- *As per BIS (SP: 2003), the FV, TV, LHSV, RSHV, BV and RV should be referred as the view from the front, the view from above, the view from left, the view from right, the view from below and the view from rear respectively.*

Methods of Multiview Projection

First Angle of Projection
Third Angle of Projection

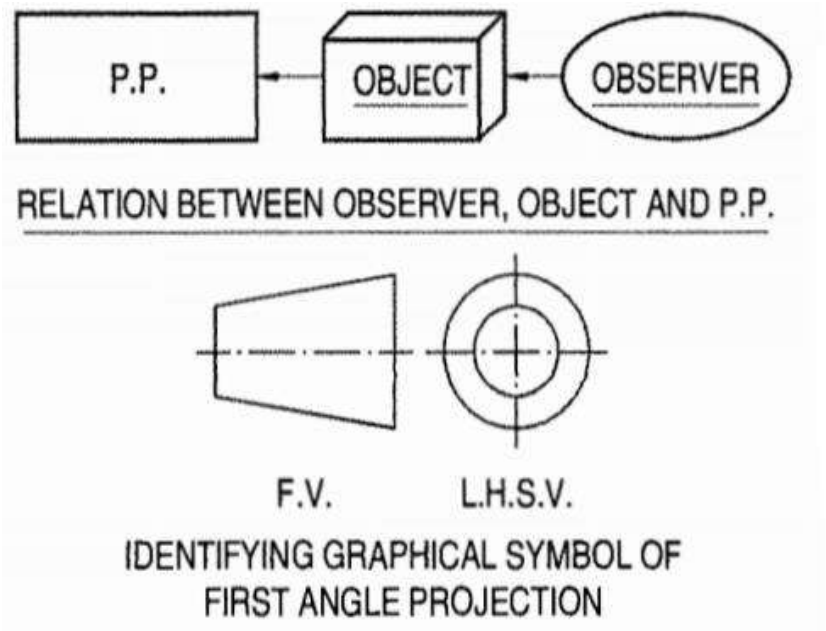


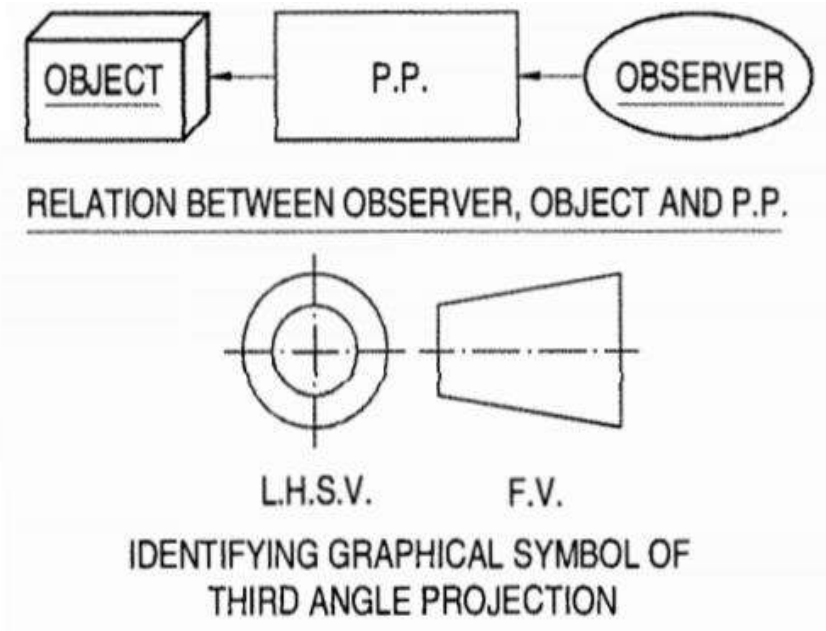
FIRST ANGLE PROJECTION



THIRD ANGLE PROJECTION

Methods of Multiview Projection





The method of first-angle projection is the British standard practice. The third-angle projection is the standard practice followed in America and in the continent of Europe.

In our country, the first-angle projection method is used as per revised SP:46-1988 and SP:46-2003 which is recommended by Bureau of Indian Standards (B.I.S.)

Difference Between First Angle & Third Angle

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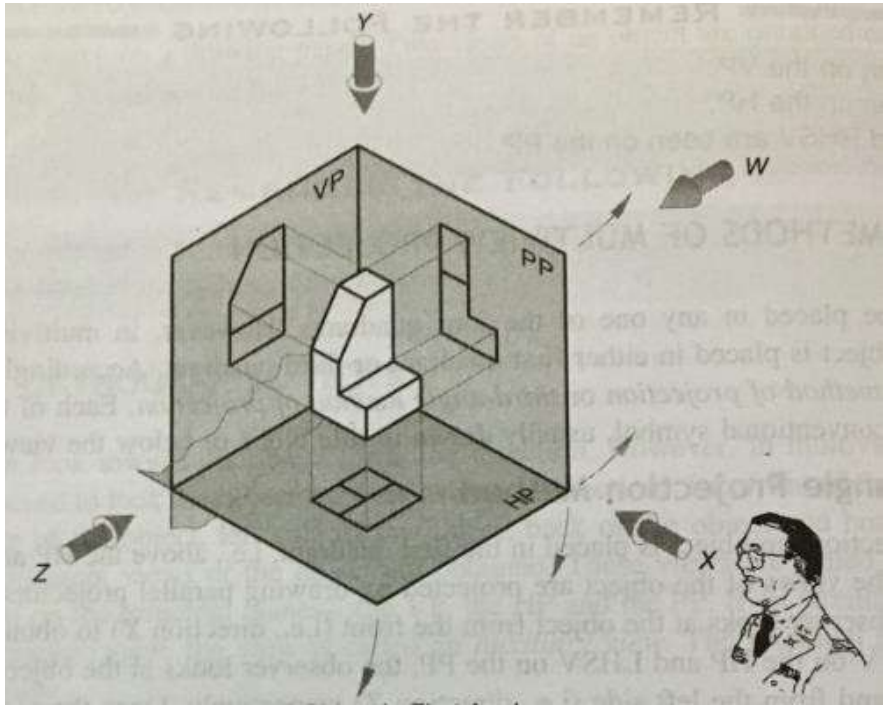
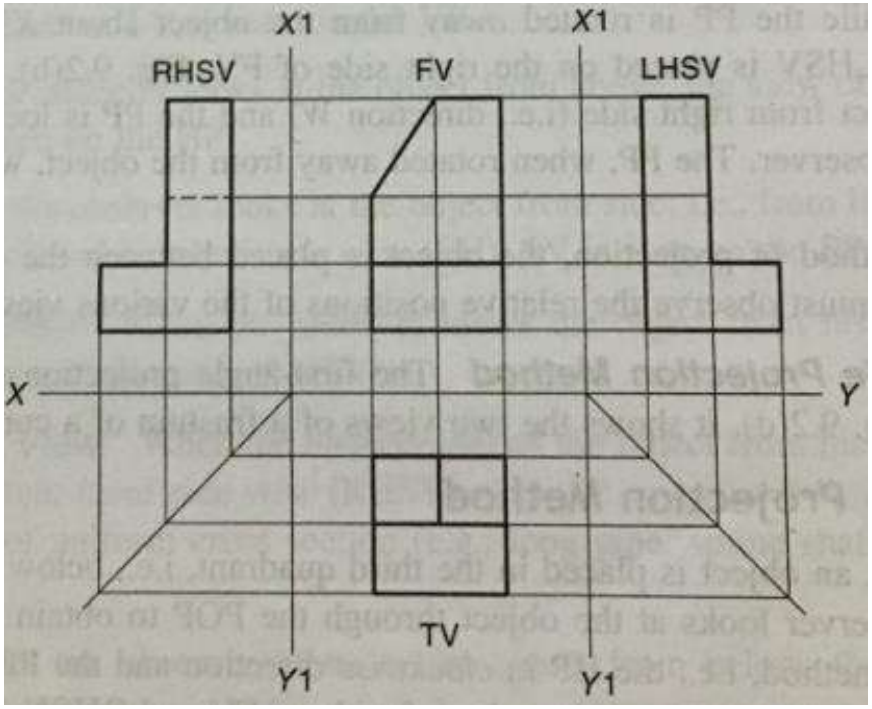
First-Angle Projection	Third-Angle Projection
The object is kept in the first quadrant.	The object is assumed to be kept in the third quadrant.
The object lies between the observer and the plane or projection.	The plane of projection lies between the observer and the object.
the plane of projection is assumed to be non-transparent.	The plane of projection is assumed to be transparent.
In this method, when the views are drawn in their relative positions, the plan tomes below the elevation, the view of the object as observed from the left-side is drawn to the right of elevation.	In this method, when the views are drawn in their relative positions, the plan, comes above the elevation, left hand side view is drawn to the left hand side of the elevation.
This method of projection is now recommended by the "Bureau of Indian Standards'' from 1991.	This method of projection is used in U.S.A. and also in other countries.

Sequence of Views

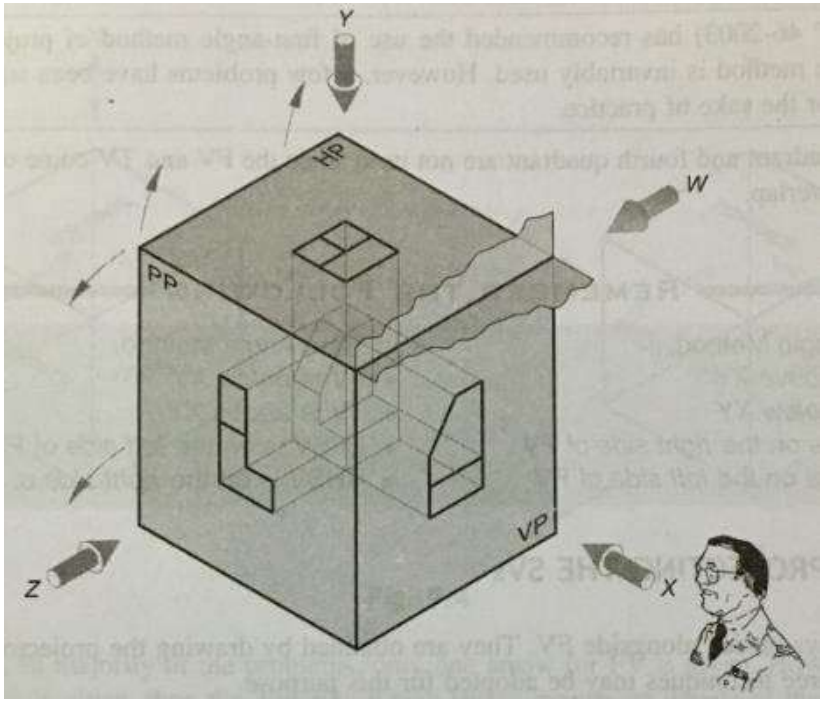
First-Angle Projection

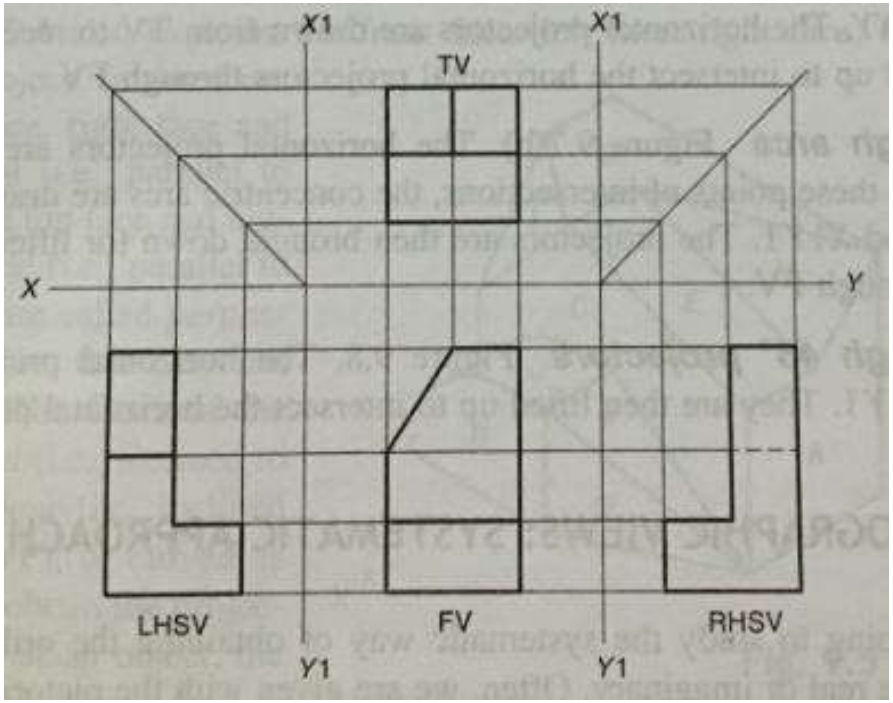




Sequence of Views

Third-Angle Projection

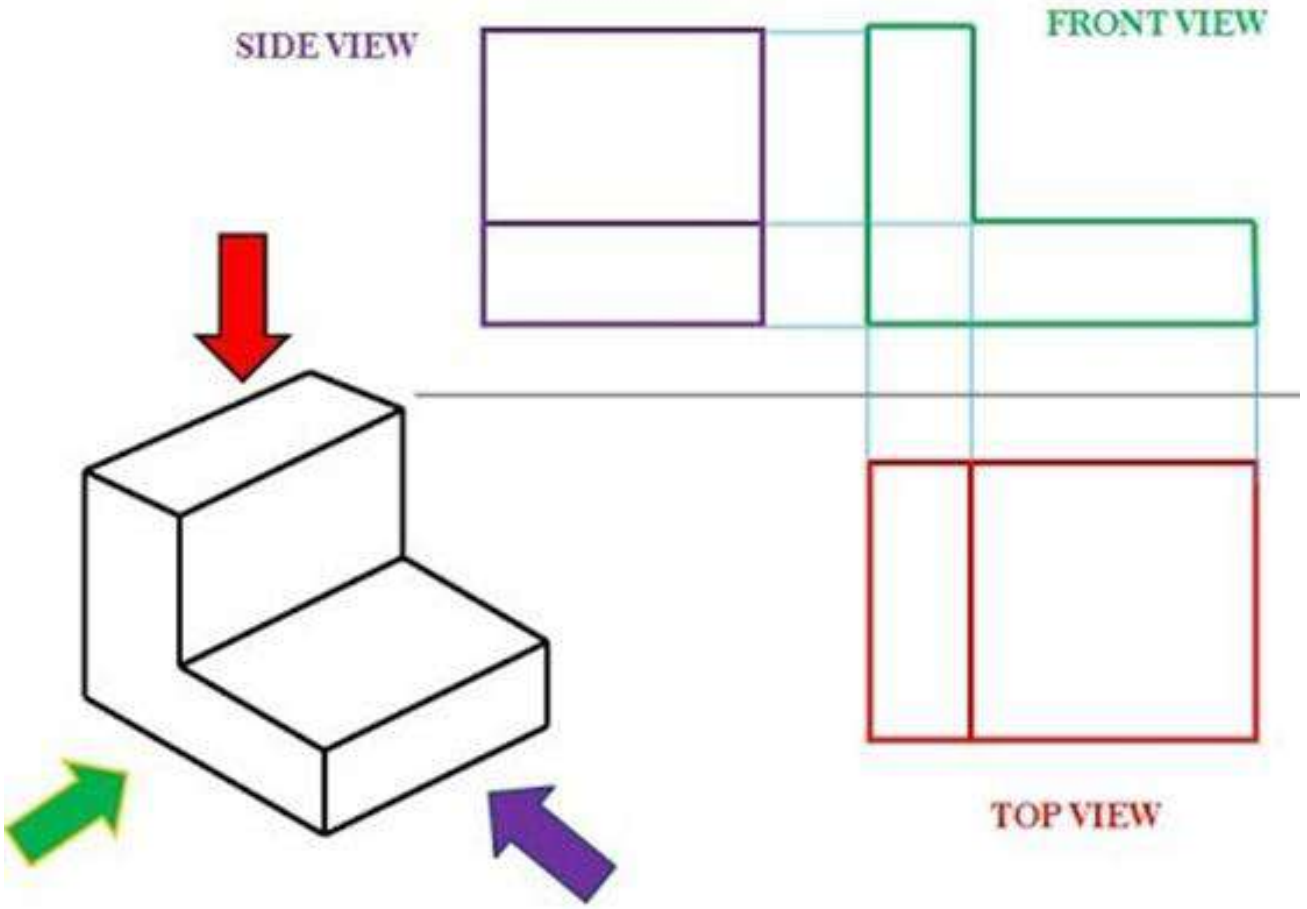




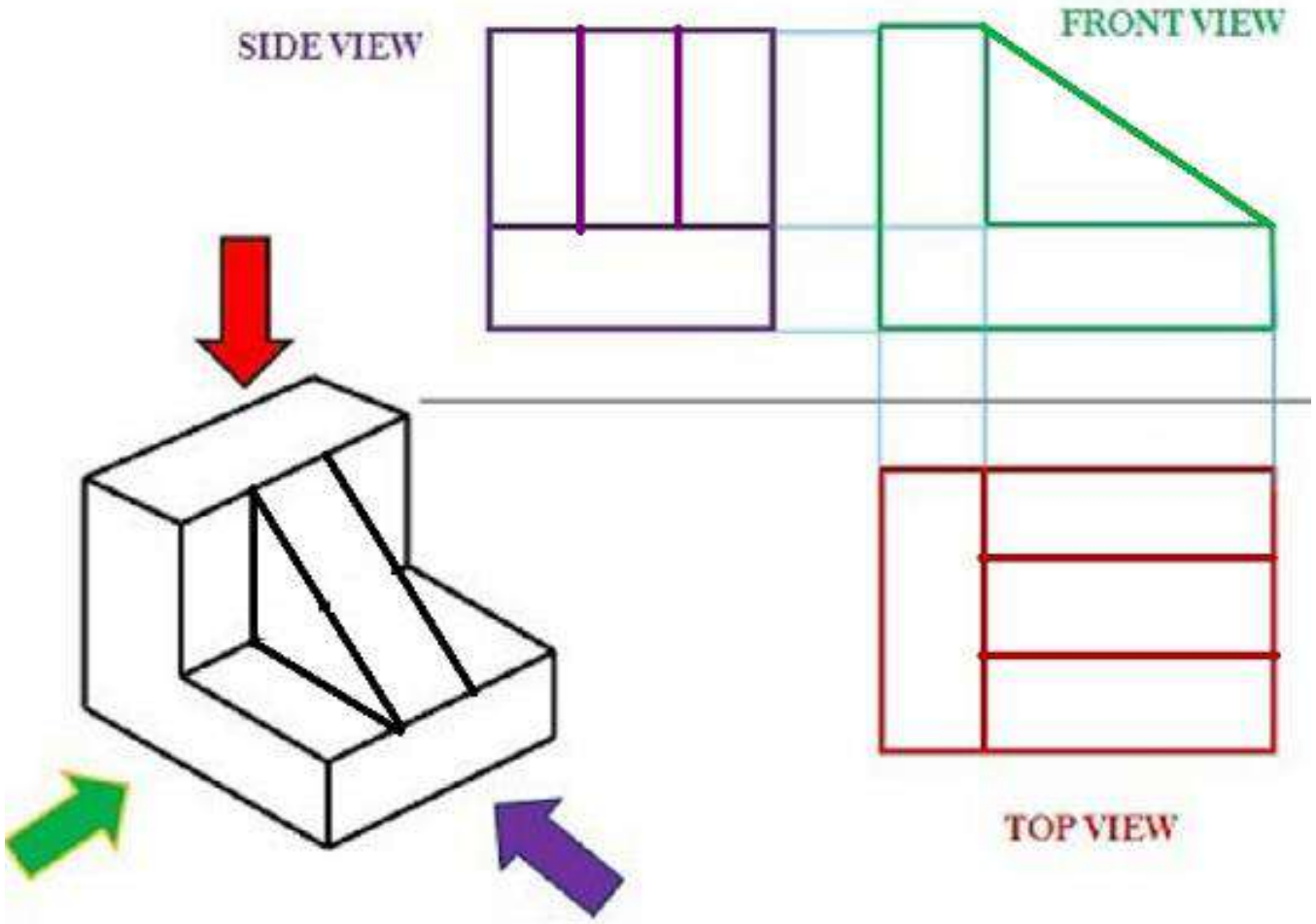
Few Points To Remember

- ✓ If the angle of projection is not given then follow first angle of projection.
- ✓ If the drawing is prepared by using a scale i.e. reducing or enlarging then mention the scale value.
- ✓ If any dimension is missing then assume the missing dimension in proportion to other available dimensions.
- ✓ Missing depth of hole can be assumed as through hole.
- ✓ If direction of view for front view is not available then the view of maximum length should be assumed as front.
- ✓ Over dimensioning should be avoided.

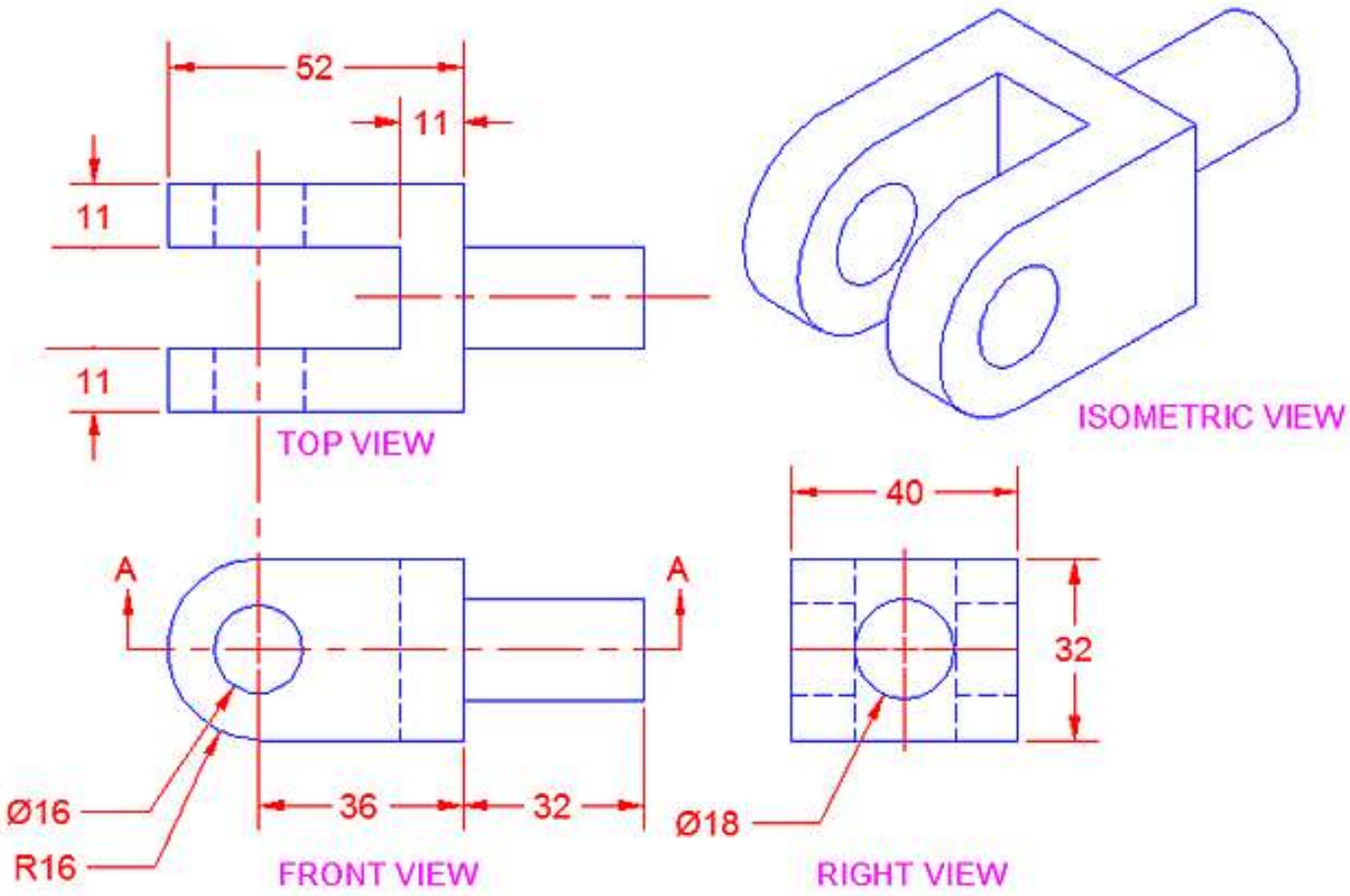
Few Examples



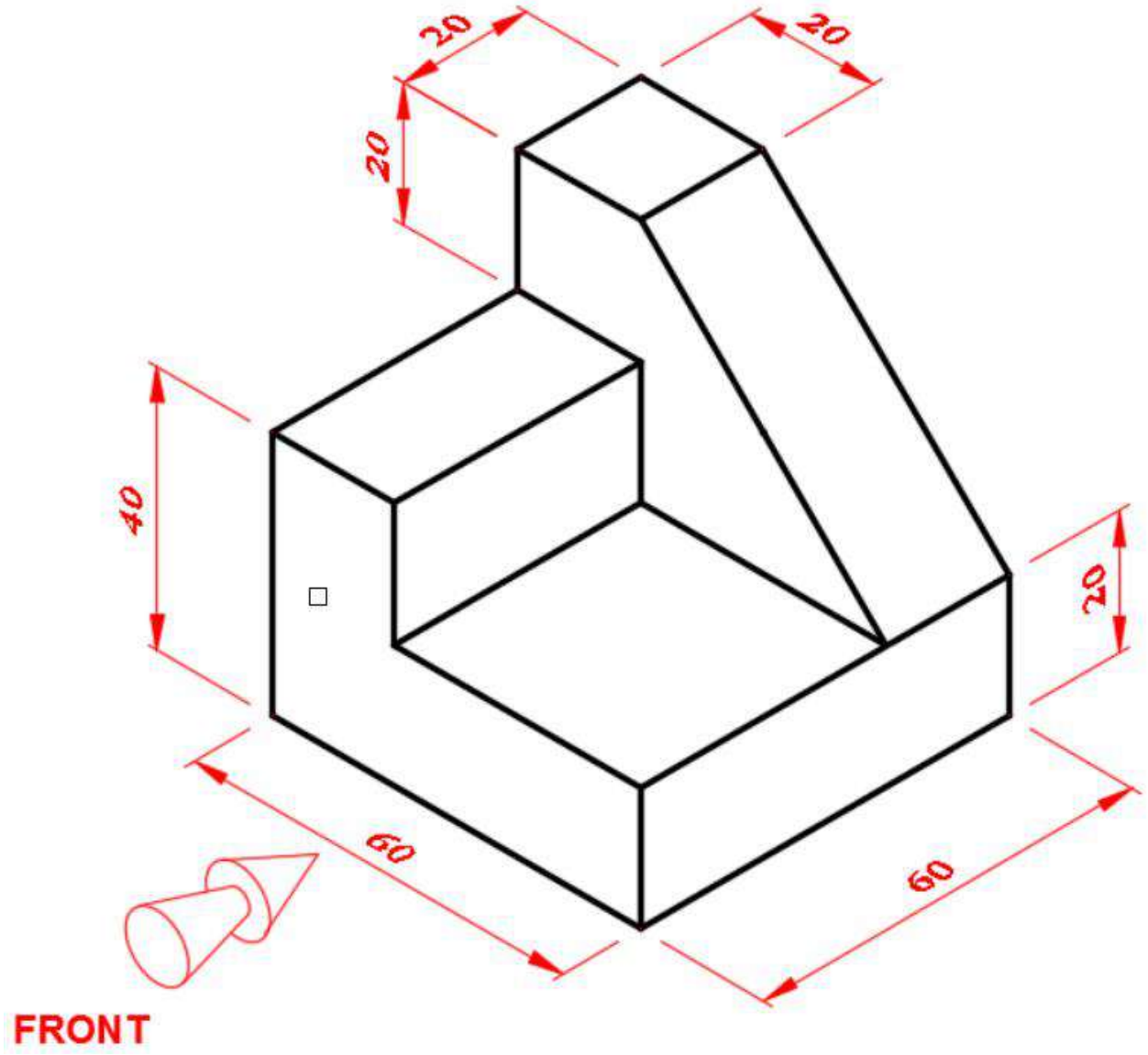
Few Examples



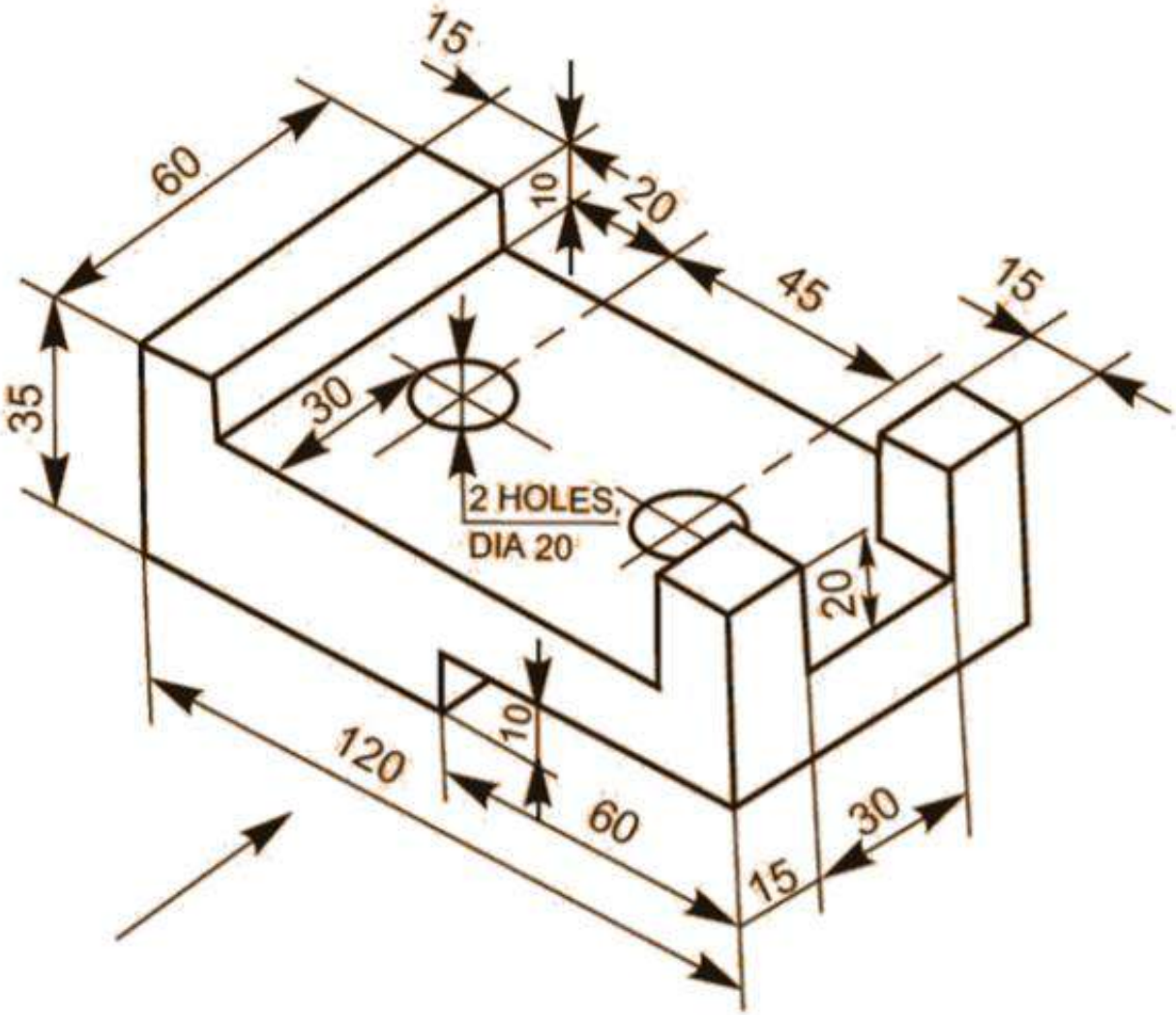
Few Examples



For Practice



For Practice



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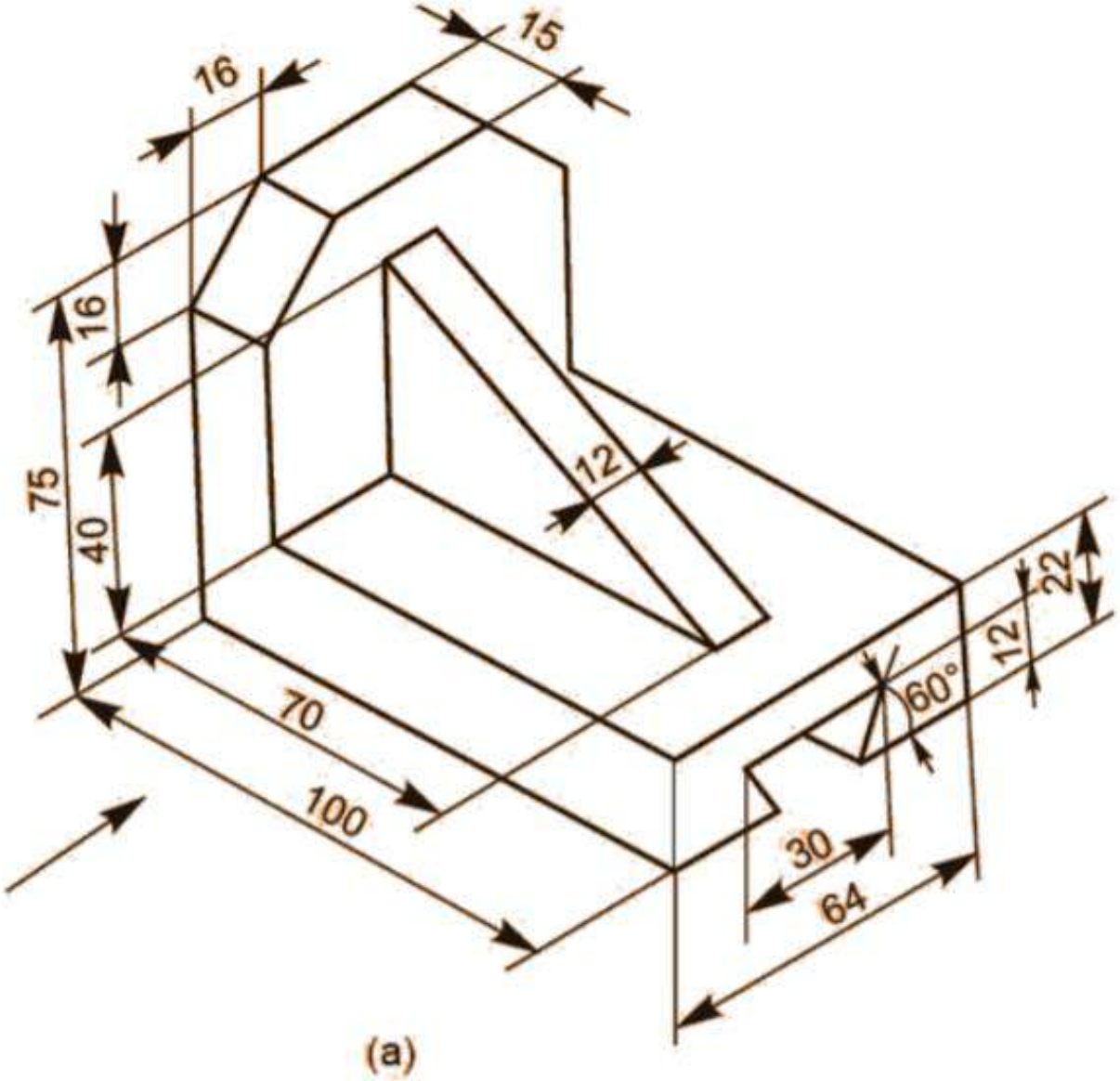
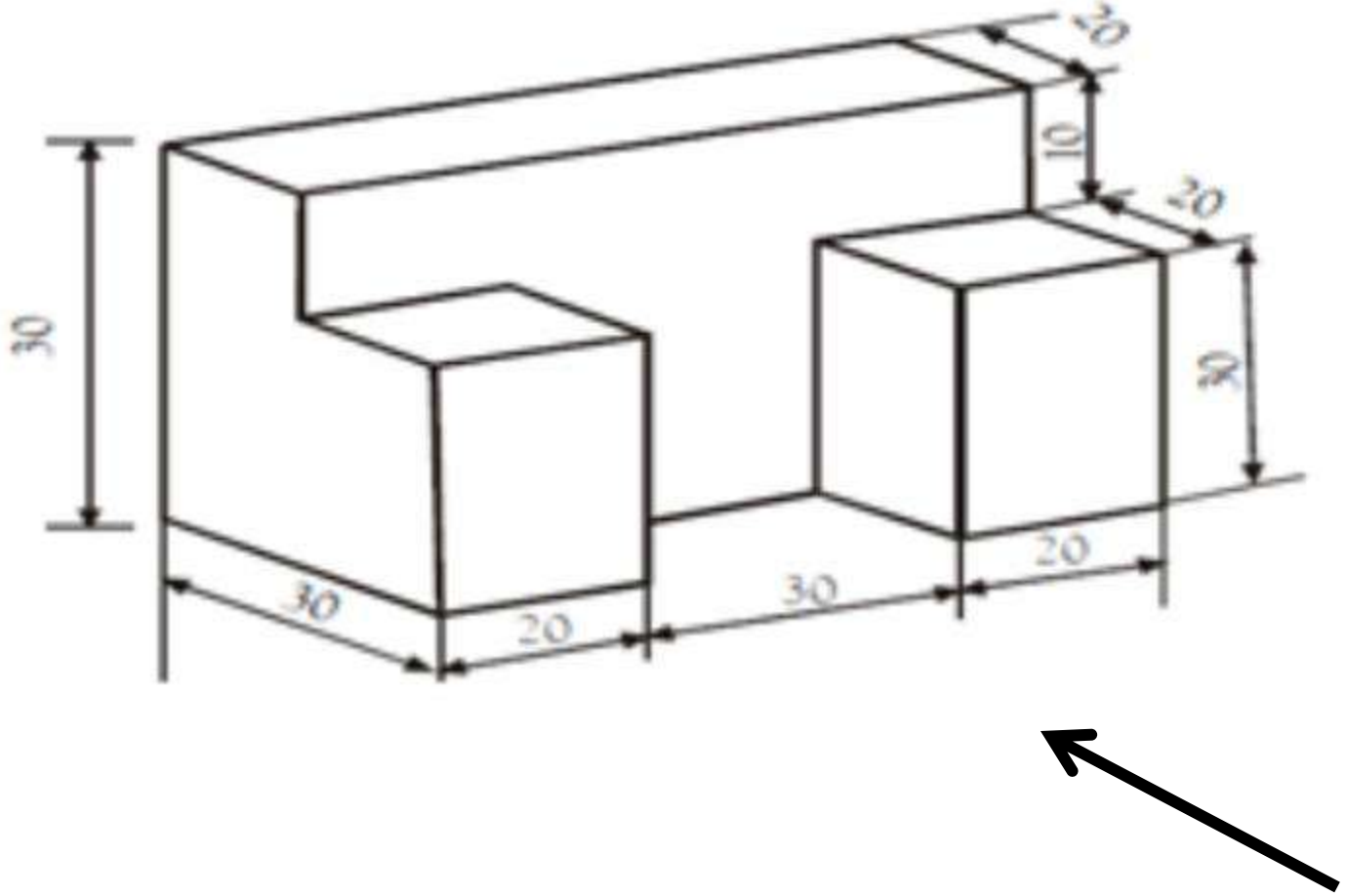


(a)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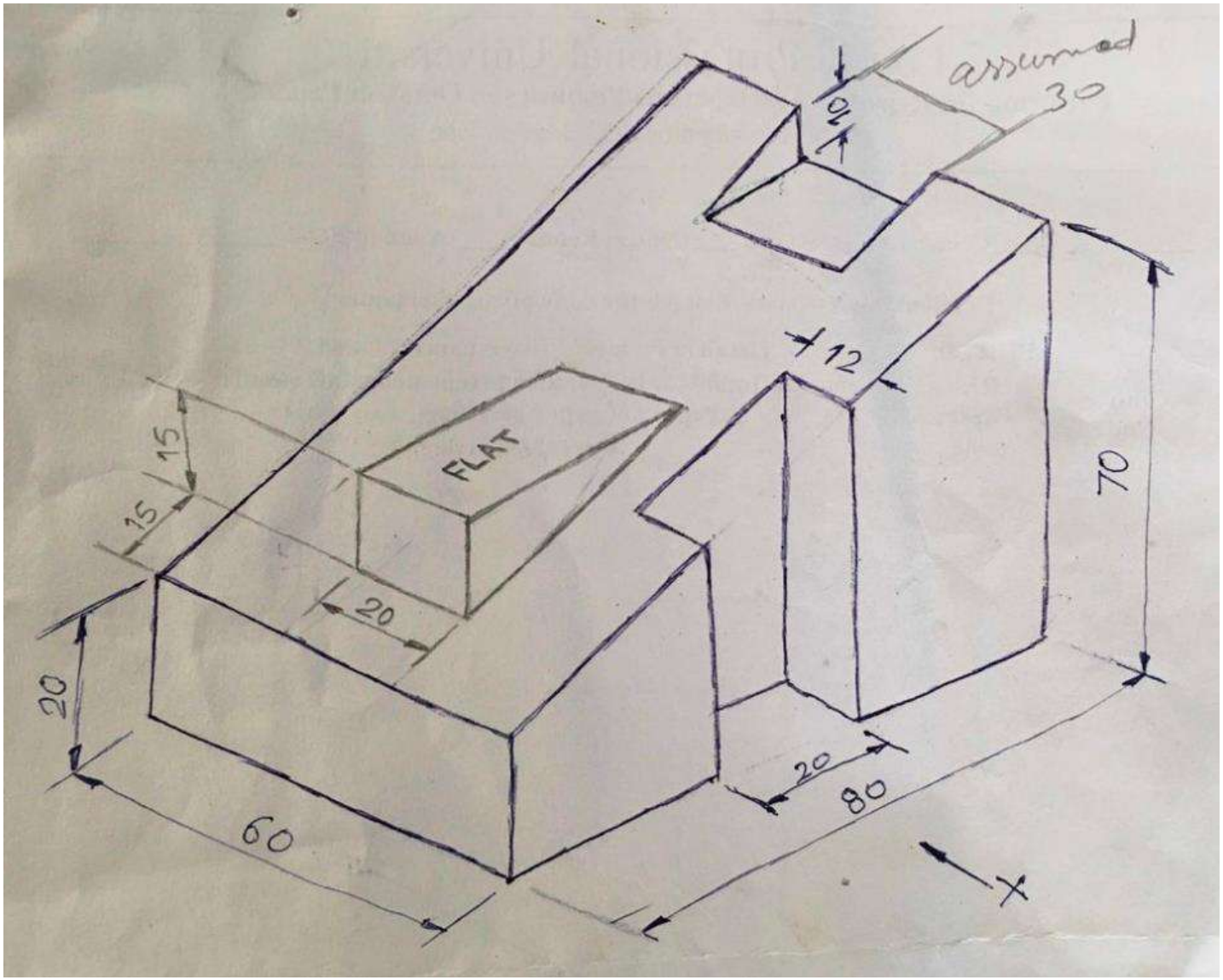
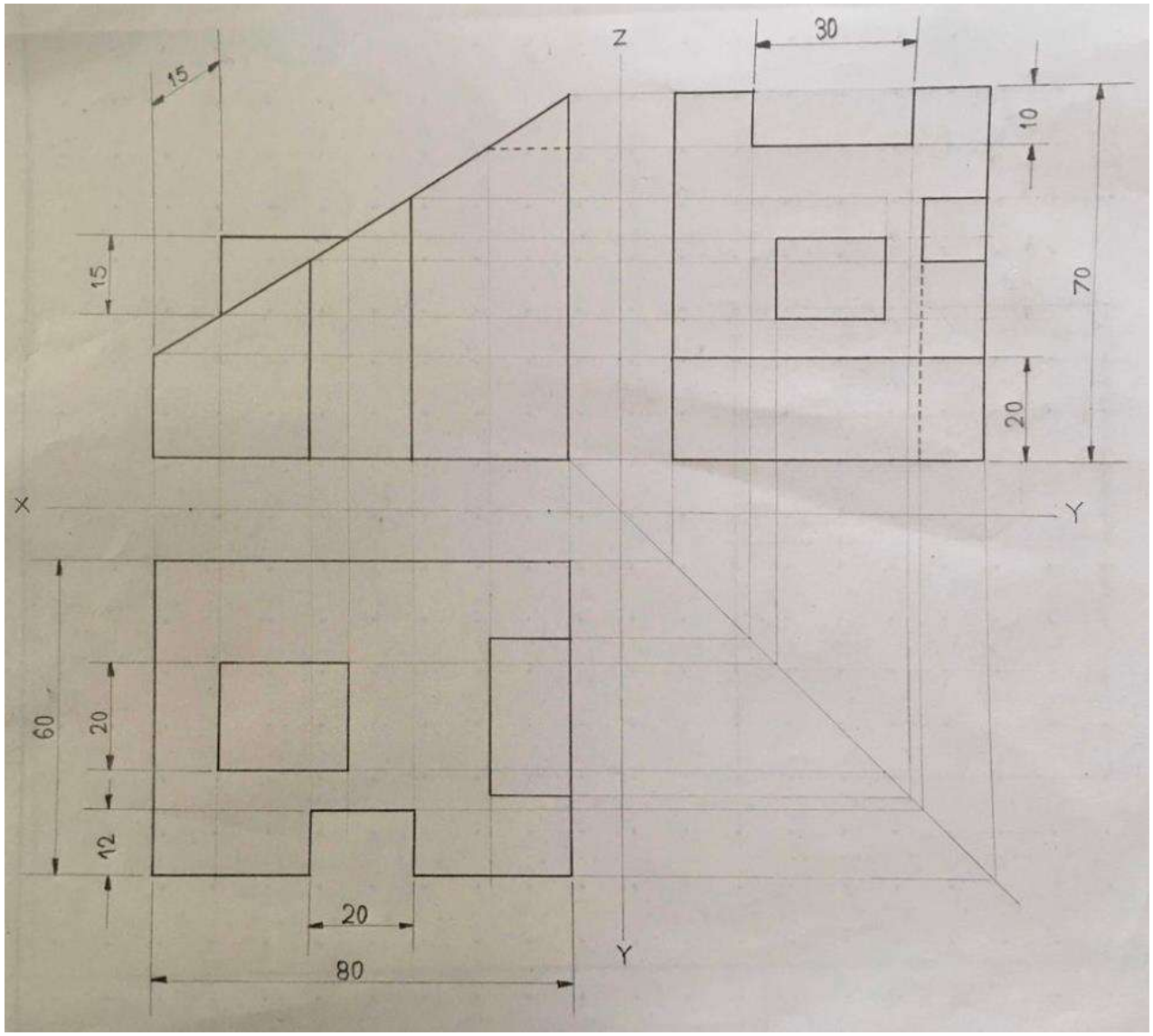
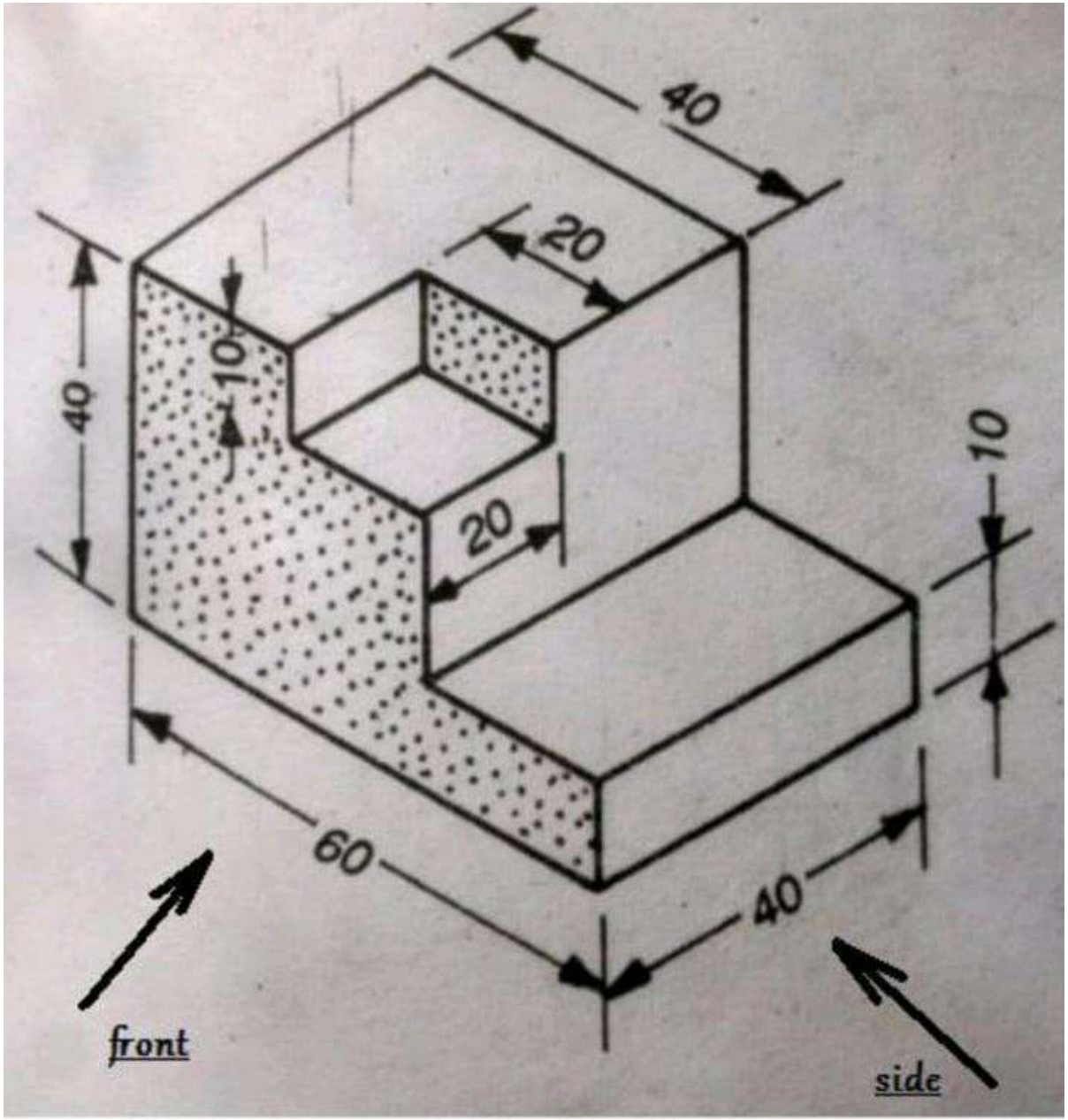
For Practice



For Practice

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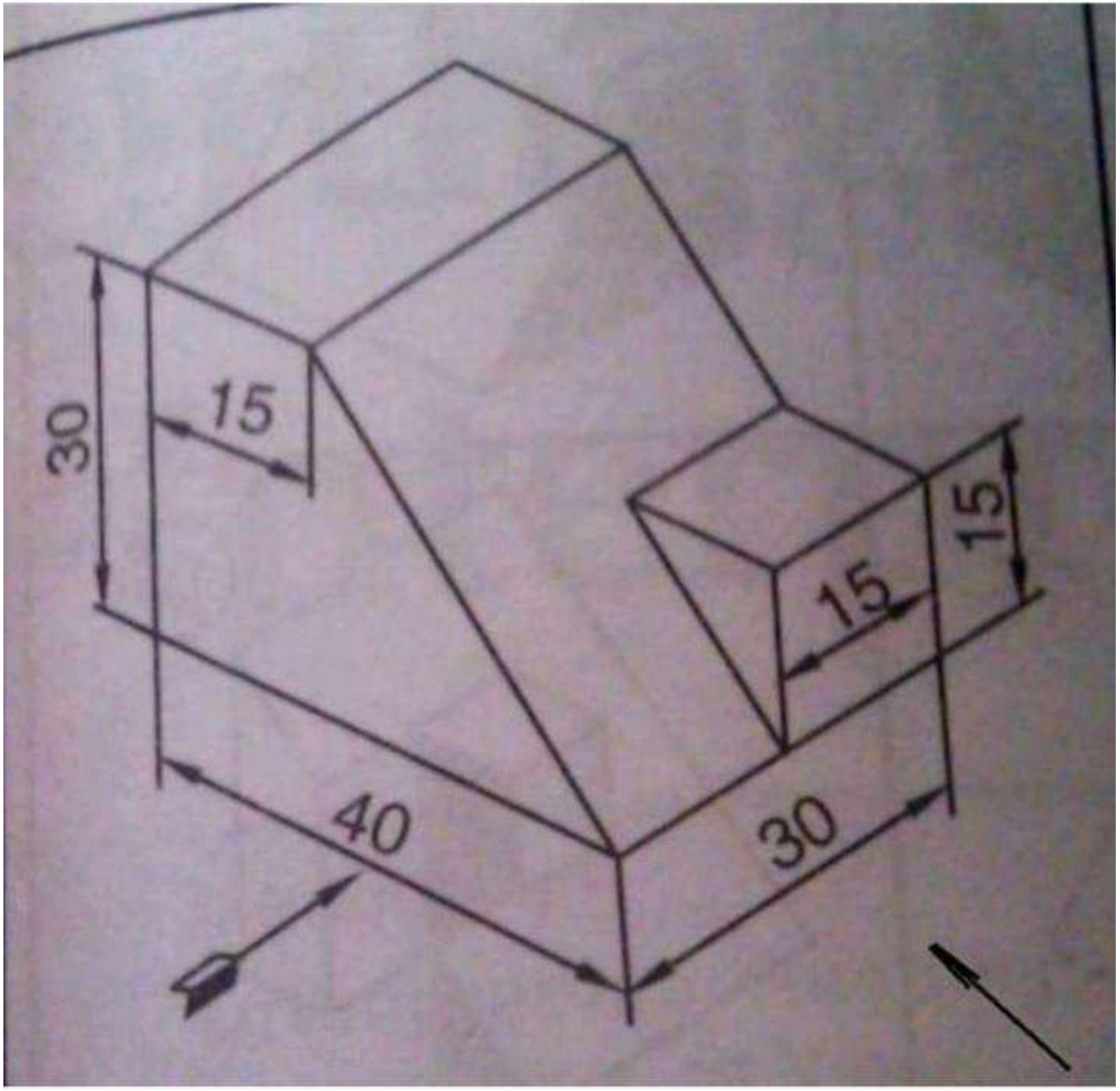
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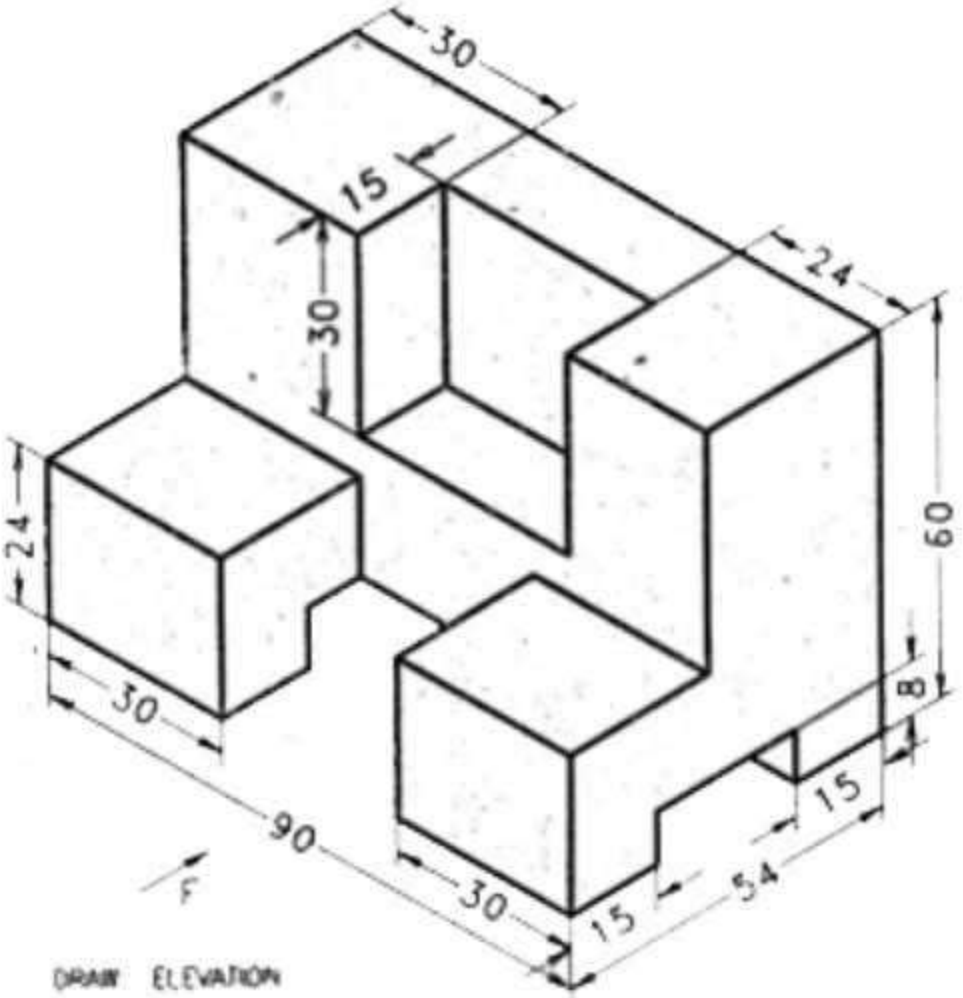
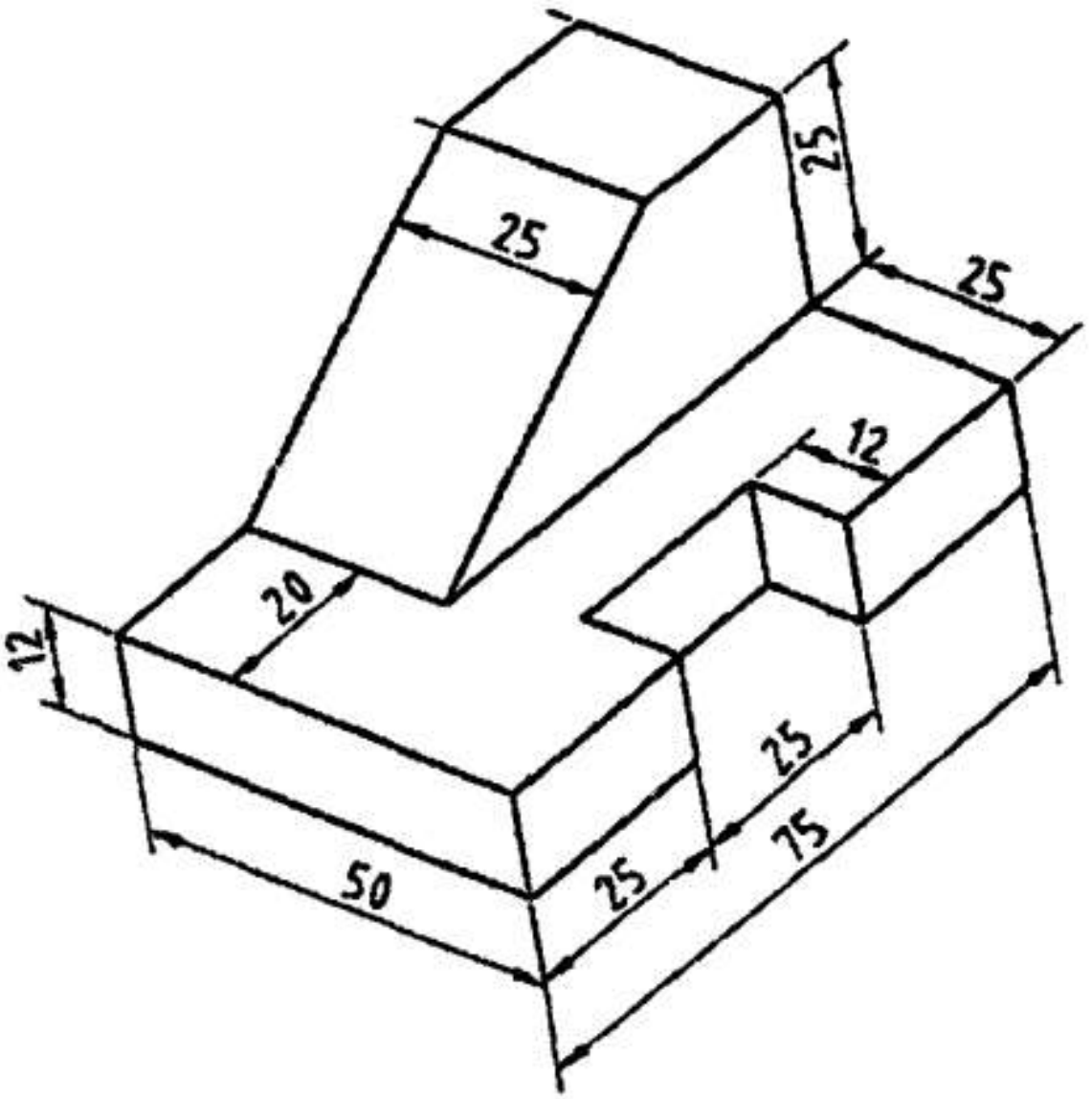


Fig. F1.34 A block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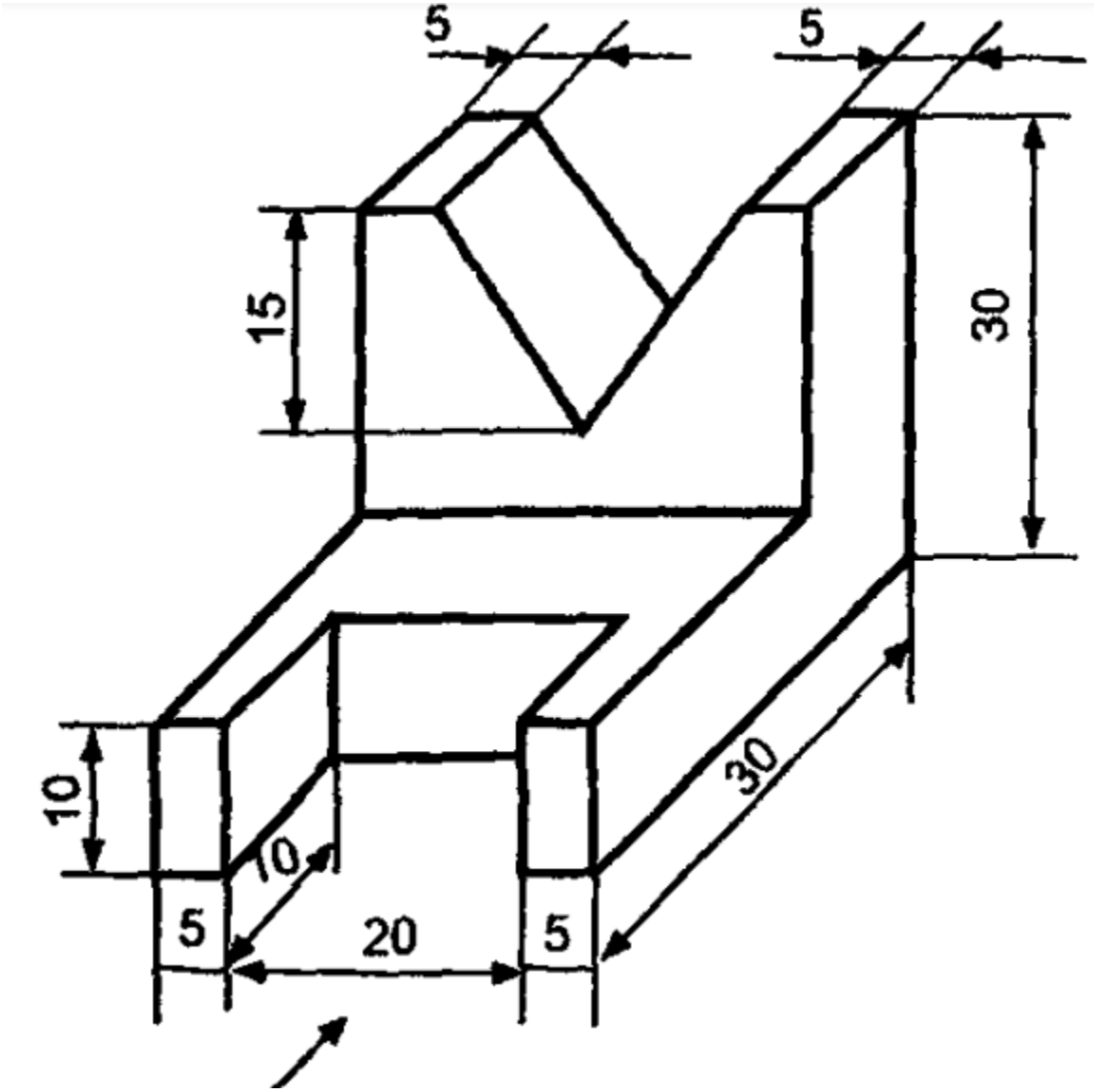
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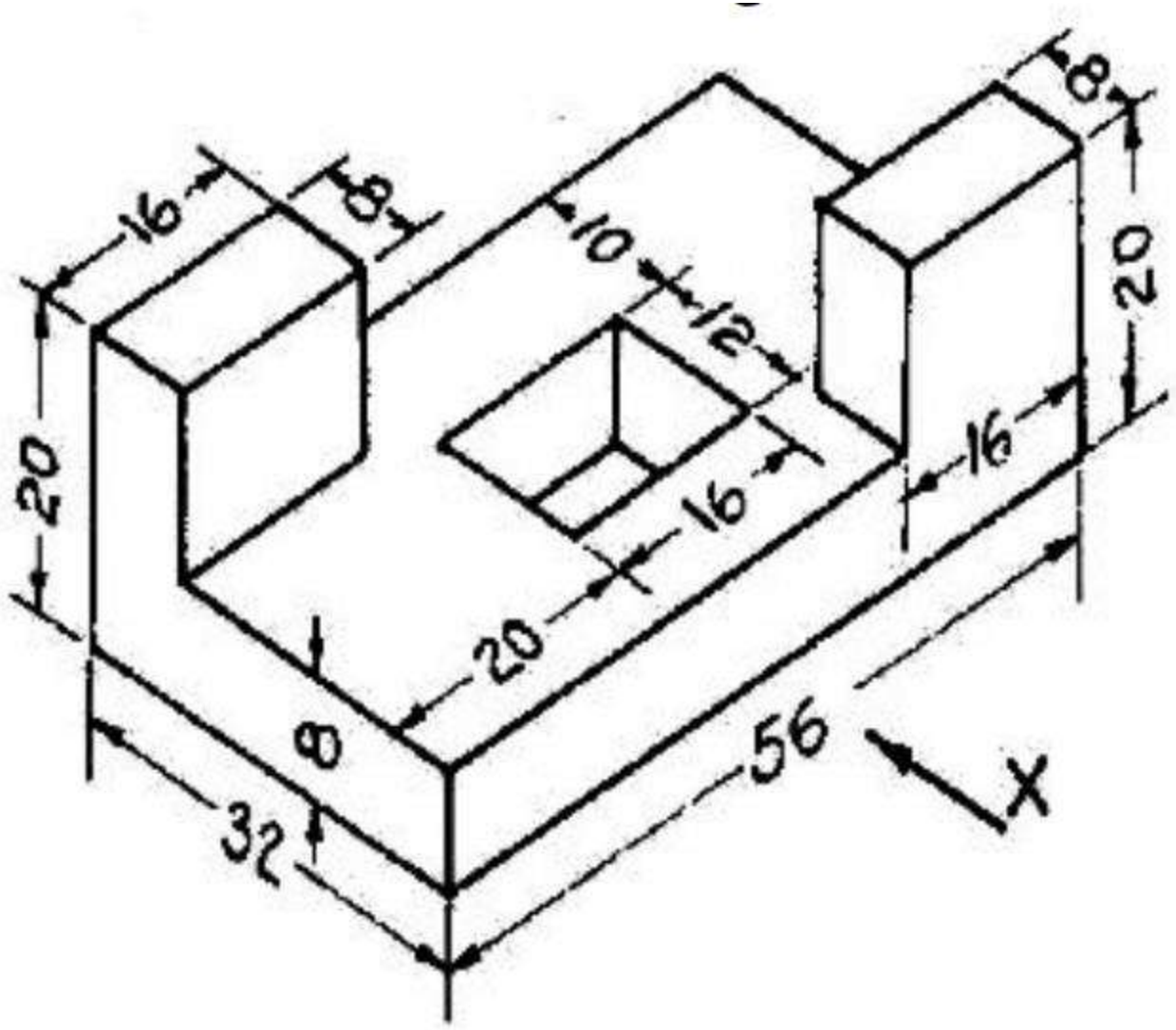
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